

## Geopolitical disruptions and the manufacturing location decision in multinational company supply chains: a Delphi study on Brexit

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## Geopolitical disruptions and the manufacturing location decision in multinational company supply chains: a Delphi study on Brexit

**Purpose:** This study investigates the impact of geopolitical disruptions on the manufacturing supply chain (SC) location decision of managers in UK multinational firms. The context of study is the UK manufacturing sector and its response to the UK’s decision to leave the European Union (EU), or Brexit.

**Design/methodology/approach:** The study adopts an abductive, theory elaboration approach and expands on Dunning’s eclectic paradigm of international production. A Delphi study over four iterative rounds is conducted to gather and assess insights into manufacturing SC location issues related to Brexit. The panel consisted of 30 experts and managers from a range of key industries, consultancies, governmental organisations, and academia. The Delphi findings are triangulated using a focus group with 38 participants.

**Findings:** The findings indicate that the majority of companies planned or have relocated production facilities from the UK to the EU, and distribution centres (DCs) from the EU to the UK. This was because of market-seeking advantages (being close to major centres of demand, ease of access to local and international markets) and efficiency-seeking advantages (costs related to expected delays at ports, tariff and non-tariff barriers). Ownership and internalisation advantages, also suggested by the eclectic paradigm, did not play a role in the location decision.

**Originality/value:** The study elaborates on the OLI framework by showing that policy-related uncertainty is a primary influencing factor in the manufacturing location decision, outweighing the importance of uncertainty as an influencer of governance mode choices. We find that during geopolitical disruptions managers make location decisions in tight time-frames with incomplete and imperfect information, in situations of high perceived uncertainty. The study elaborates on the eclectic paradigm by explaining how managerial cognition and bounded rationality influence the manufacturing location decision-making process.

**Keywords:** Manufacturing location decision, geopolitical disruption, offshoring, reshoring, Brexit

## 1. Introduction

Since the 1970s, companies have established manufacturing facilities in low wage economies to minimise costs and gain access to emerging markets (de Sá et al., 2019). However, globalisation has made companies susceptible to disruptions that can occur at any point along internationally dispersed supply chains (Ferdows, 2018). Supply chain (SC) disruptions are defined as events that disturb the flow of products or services across SCs and negatively impact a company's performance (Ho et al., 2015, p. 5035). SC disruptions can either be natural, such as hurricanes, floods and famines, or man-made, such as war, terrorism and political disputes (Hendricks and Singhal, 2005a,b). Managers are often obliged to re-evaluate the manufacturing location decision in order to mitigate SC disruption risks that can occur around the world (Ellram et al., 2013).

The extant literature has examined the impact that natural disasters (Srai and Ané, 2016) and man-made disruptions (Ellram et al., 2013) have on manufacturing location decisions. However, the impact that geopolitical disruptions have on the location of manufacturing facilities is largely ignored (Hansen *et al.*, 2017). This is an important omission because geopolitical disruptions are increasing in severity and frequency (World Economic Forum, 2020). Recent political disputes, such as the dissolution of NAFTA and the US-China trade war, have seen significant shifts in the location of production facilities (Forbes, 2020; New York Times, 2020). Managers therefore need guidance regarding how to reposition manufacturing assets in the event of a geopolitical disruption or they may experience supply delays at border crossings and cost increases from newly imposed tariff and non-tariff barriers (Scheibe and Blackhurst, 2018).

The motivation of this study is to provide guidance to managers and fill an important gap in our knowledge by answering the following research questions: *How do geopolitical disruptions impact the manufacturing SC location decision of multinational firms?* And: *What are the drivers of manufacturing SC location decisions of multinational firms in response to geopolitical disruptions?* We examine these questions through the lens of the eclectic paradigm of international production; this argues that the determinants of international production for multinational companies (MNCs) relate to ownership, location, and internalisation (OLI) advantages (Dunning, 1998, 2001). The choice of where to locate production is said to be determined by the costs and benefits of adding value to products in a particular location (Dunning, 1998). Using an abductive, theory elaboration approach (Ketokivi and Choi, 2014), we compare the underpinning tenets of the eclectic paradigm to empirical data gathered from a Delphi study of 30 experts and managers from a range of key industries, consultancies,

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governmental organisations and academia. The aim is to elaborate on the eclectic paradigm by examining the theory within the context of managers responding to the geopolitical disruption that arose from the UK’s decision to leave the European Union (EU), or Brexit. Findings from the Delphi study are triangulated using a focus group of 38 managers working for UK manufacturing firms. As findings emerged from the data that were not addressed by the eclectic paradigm, we were able to advance novel propositions and elaborate on theory.

Our findings indicate that during geopolitical disruptions, location advantage is the primary driver for moving production offshore/onshore, with respondents not citing ownership or internalisation as important factors in the decision-making process. The key location factors are market-seeking advantages (being close to major centres of demand, ease of access to local and international markets) and efficiency-seeking advantages (costs related to expected delays at ports, tariff, and non-tariff barriers). We find that due to the nature of geopolitical disruptions, managers are forced to make location decisions in situations of high uncertainty based on incomplete and imperfect information. We therefore propose that managerial cognition, bounded rationality, and perceptions of heightened uncertainty affect the location decision-making process.

The remainder of this paper is structured as follows; the next section begins with an overview of internationalisation theory and provides a discussion of the relevant literature on SC disruption risk and the manufacturing location decision. Section 3 discusses the research design, data collection and analysis methods. Section 4 presents the findings, and Section 5 discusses the findings in relation to the extant literature to arrive at a series of theoretically informed propositions. Section 6 concludes by outlining the study’s contribution to theory and practice, and suggesting some potentially fruitful avenues for future enquiry.

## 2. Literature Review and Theoretical Underpinnings

### 2.1 The Eclectic Paradigm

The eclectic paradigm sets out the criteria for the manufacturing location decision based on the ownership-specific advantages of firms contemplating foreign production and the factors that make a foreign market attractive for production (Dunning, 1998). The paradigm asserts that for a company to expand its production overseas, three conditions must be satisfied; ownership, location, and internalisation (OLI) advantages (*ibid.*). Ownership advantage refers to the benefits that companies secure from ownership rights, such as branding, trademark, or patent rights, or from the management of internally-available skills. It extends to intangible assets that allow the company to remain competitive, such as the presence of particular organisational and marketing systems, innovation capacity and know-how (Meijboom and Vos, 1997). The internalisation advantage considers the make-buy trade-off outlined in transaction cost economics (Williamson, 1987), and refers to when a company decides to invest in its core competencies and make a product in-house by internalising cross-border intermediate product markets (Meijboom and Vos, 1997). The location advantage is relevant to the spatial distribution of facilities and is achieved by conducting value-adding activities in an alternative region or country, due to the availability and costs of the resources in that location (Dunning, 1998).

Within the broad category of location advantage, Dunning (1998) suggests that MNCs engage in international manufacturing activities because of four factors:

- (1) Resource-seeking advantage: this concerns the availability of raw materials and infrastructure, as well as potential local partners in the host country to jointly promote knowledge and capital-intensive resource exploitation.
- (2) Market-seeking advantage: this concerns access to the regional market and a government's economic policies, including macro-economic and macro-organisational policies. It also includes the price and availability of local talent and professional labour as well as the presence of primary suppliers.
- (3) Efficiency-seeking advantage: this is the production cost-related factors and government incentives. It emphasises the government's role in eliminating obstacles to reform economic activity, and facilitate the upgrading of human resources by providing suitable educational and training programmes.

- (4) Strategic asset-seeking advantage: this concerns the knowledge-related assets, and synergies related to maintaining a local presence (e.g., gaining localised tacit knowledge).

Despite providing important insights into the manufacturing location decision, early contributions to the eclectic paradigm have received criticism on three fronts. First, critics argue that the framework struggles to explain the role of managerial cognition during the location decision making process (Cantwell and Narula, 2001; Devinney et al., 2003). According to the paradigm, OLI advantages influence a firms' entry mode decision by affecting management's perception of asset power (ownership advantage), market attractiveness (location specific advantage), and costs of integration (internalisation advantage), so that when OLI advantages are high, firms prefer more integrated modes of entry. What the framework fails to deal with is the process by which OLI advantages are combined within a basket of choices from which managers may select when making the location decision. Instead, the paradigm assumes that a semi-autonomous firm will automatically relocate production facilities if a country offers lower costs, provides more opportunities for innovation, or provides the firm with enhanced market access (Devinney et al., 2003).

Second, early contributions to the paradigm had difficulty in explaining the globalisation of production spurred on by MNCs and the emergence of intra-firm trade (Cantwell and Narula, 2001), where products are traded internationally but stay within the ownership of the MNC. Increasing cross-border competition and enhanced interdependence of economic actors in different locations has changed the way multi-national firms organise their innovation activity across geographically dispersed SCs (Handfield et al., 2020). There is also an increasingly international aspect of research and development (R&D) activity within MNCs as well as between MNCs and their SC partners, where firms will engage in R&D activities regardless of a supplier's geographic location (Narula and Hagedoorn, 1999). This means that ownership advantages must be thought of in relation to the international competition stemming from other MNCs and their SC partners rather than relative to domestic companies in a particular host country (Cantwell and Narula, 2001). While an MNC may not have an absolute cost advantage over a domestic firm in a host country, it may still have ownership advantages in terms of its connection to an international network of innovative suppliers. In addition, the geographical dispersion of innovative suppliers can support the new technology development capabilities of the MNC, since the MNC can tap into alternative streams of innovation from different nodes in the SC (Zander, 1997). Therefore, ownership and location advantages can often overlap within MNCs, where the company establishes manufacturing facilities in a



particular country to access new markets and talented pools of labour, while gaining ownership advantages by being co-located with key suppliers to access their knowledge and technological capabilities.

Third, the paradigm provides limited insights into the role of government policy in the manufacturing location decision (Devinney *et al.*, 2003). Government policy is said to affect all three aspects of the OLI framework, either through subsidies, tax breaks, immigration rules or legislation on the hiring and firing of workers. State intervention in the market, be it in the form of industrial policy that supports strategic sectors or policies that seek to attract highly skilled labour, may influence where companies situate their facilities. However, other forms of state intervention, such as the increased tariffs that have arisen from the US-China trade war, can also cause companies to move production facilities out of particular countries (Handfield *et al.*, 2020); these are not considered as an important factor in the OLI framework. Early contributions to the eclectic paradigm implicitly assume that governments are an enabler of OLI advantages, but fail to consider how disruptive geopolitical events can dissuade MNCs from locating in a particular country (Devinney *et al.*, 2003).

Dunning has since attempted to address criticisms of his framework, stating that the O and L advantages should not be treated as distinct but as overlapping and co-evolving (Dunning, 2015). The framework now pays greater attention to the importance of government policy in markets; it argues that structural market distortions that affect the costs and/or revenues of producing in different locations may be either encouraged or discouraged by state intervention. Moreover, the framework acknowledges the increasing frequency of intra-firm trade, stating that such trade may provide certain competitive advantages in terms of the possible gains from specialised sourcing or transfer price manipulation (Dunning, 2015). The paradigm now acknowledges that managers make the decision on where to locate production, selecting centralised production if the MNC is hierarchical and rationalising resource allocation, or localised manufacturing if factors such as national culture must be taken into account (Dunning, 2015).

Finally, the framework now offers a more contemporary view of the MNC, no longer defining it in terms of the ownership of income-generating assets overseas, but instead as a lead firm that takes responsibility for orchestrating a global SC (Dunning and Lundan, 2008). According to this view, the MNC does not develop innovation in isolation, but makes connections between knowledge sources, such as suppliers and customers, located across a globally dispersed SC. Ownership advantages are now said to relate to the capabilities possessed by MNCs in orchestrating global SCs in order to achieve sustained streams of



innovation and to cultivate new combinations of knowledge, especially at the nodes of the SC where the greatest value creation can be achieved (Dunning, 2015).

These recent extensions have made the eclectic paradigm a useful framework for understanding the manufacturing location decision in SCs. For example, Gray et al. (2013) discuss how location advantages can influence the location of SC assets, arguing that factors that are not easily quantifiable, such as disruption risks and intellectual property risks, should be considered alongside quantifiable factors, such as tax rates and labour costs. Ellram et al. (2013) applied the location aspect of the OLI framework to understand the factors that affect organisational perceptions of regional attractiveness as the prime location for owned manufacturing facilities. They suggest that factors affecting a region's attractiveness change significantly over time, with government trade policies increasingly considered as a differentiator (Ellram et al., 2013). Ellram et al. (2013) propose that cost should not be the major motivating factor in the location decision as other factors, such as SC disruptions and risk, play an increasingly important role. This study aims to elaborate on these earlier proposals by exploring the effect of government policy and SC disruptions on the manufacturing location decision. This study seeks to extend the work of Gray et al. (2013) and Ellram et al. (2013) by considering ownership and internalisation, as well as location, as factors in the context of geopolitical disruptions in the SC.

## 2.2 Supply Chain Disruption Risk

Two broad categories of risk are said to affect the location of SC assets: 1) risks arising from problems of coordinating supply and demand, and, 2) risks arising from disruptions to normal operations (Kleindorfer and Saad, 2005). This paper focuses on the latter category of disruption risks; these include operational risks (equipment malfunctions, production issues, strikes, and fraud) and risks arising from natural hazards, terrorism, and political instability (*ibid.*). A SC disruption is an event that disrupts the flow of goods or services in a SC (Craighead et al., 2007). Such disruptions typically have a negative effect on the financial and operational performance of the firm (Hendricks and Singhal, 2003; Wagner and Bode, 2008).

Scholars writing on SC disruption risks tend to focus on disruptions related to natural disasters (Knemeyer *et al.*, 2009; Sodhi and Tang, 2014), terrorist attacks (Sheffi, 2001), operational disruptions at supplier locations (Norrman and Jansson, 2004), and financial crises (Blome and Schoenherr, 2011). Only a handful of papers study the strategies that companies develop to manage the SC risk and uncertainty resulting from geopolitical disruptions (Hendry et al., 2019; Roscoe et al., 2020). For example, Hansen et al. (2017) suggest that political risks

come in the form of political instability, variability of the socio-economic environment, policy unpredictability, macro-economic instability, institutional capacity limitations, and legal unpredictability. They find that managers tend to adopt an avoidance strategy regarding traditional political risk (i.e., political instability and social unrest), while expecting to manage other non-traditional risks. Hendry et al. (2019) study constitutional change and note that this type of political disruption has longer time horizons than a natural disaster or war, which gives companies time to adequately prepare and reconfigure their SCs accordingly. Roscoe et al. (2020) study the different strategies that firms use to manage the uncertainty associated with geopolitical disruptions; they find that companies will either follow a wait-and-see strategy (where managers do not make resource commitments until the exact nature of the political disruption is known), or a proactive/reactive strategy (where SC assets are relocated if sufficient resource slack is available within the firm). The consensus of these authors is that political disruptions influence managerial decision making in terms of building SC redundancies or developing new relationships with suppliers.

### *2.3 The Manufacturing Location Decision*

The 'shoring' decision is made along two dimensions; geographical and governance mode (Tate and Bals, 2017). The geographical dimension refers to when a company operates in its own country or across national borders; it takes a range of forms including offshoring, nearshoring and reshoring (McIvor, 2013). The geographical dimension is normally considered in relation to the country in which the company is registered (Fratocchi et al., 2016). Offshoring refers to when production is sent to another country, typically overseas; it is often driven by cost minimisation objectives including access to low-cost labour and raw materials (Ellram et al., 2013a; Tate and Bals, 2017). However, the cost advantages of offshoring production to other countries are gradually eroding, resulting in companies repatriating their production to home countries (Fynes et al., 2015; Moradlou and Backhouse, 2016). Reshoring refers to repatriating production from a previously offshored location to the home country (Tate and Bals, 2017). Moradlou et al. (2017) studied the automotive sector in the UK and identified a lack of responsiveness in the SC and long lead-times to be the primary motivation behind reshoring manufacturing activities from India to the UK. Another study by Theyel et al. (2018) identified the overestimation of cost saving in offshoring, quality problems, product development and intellectual property, as the reasons behind reshoring to the UK. Companies can also engage in a nearshoring strategy; this refers to the repatriation of production activities from a lower cost country, such as China, to another lower cost country, such as Poland, that

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is nearby a major market such as Europe (Hartman et al., 2017). The other dimension in the “shoring” decision is the governance mode; this allows companies to outsource their activities to third party providers or make them in-house via insourcing (Gray et al., 2013).

The drivers behind the manufacturing location decisions have been widely explored in the literature and are highly dependent on a number of contingency factors, such as host country, home country, firm size, industry sector and company strategy (Bals et al., 2016; Fratocchi et al., 2014, 2016; Gray et al., 2017; Moradlou et al., 2017; Moradlou and Backhouse, 2016). The general consensus is that cost and company strategy are the key criteria for the location decision (Ellram et al., 2013; Tate and Bals, 2017). For example, factors such as transportation and fuel costs, labour costs and productivity, SC responsiveness, end customer proximity, and currency valuation volatility, have been identified as drivers of global manufacturing location decisions (Ellram et al., 2013).

However, the role of geopolitical disruptions as a driver for relocating manufacturing and distribution facilities has received limited attention in the Operations and Supply Chain Management literature. Scholars who discuss the effects of geopolitical disruptions in SCs (Hansen et al., 2017; Hendry et al., 2019a; Roscoe et al., 2020), do so from a risk management perspective, but fail to examine whether manufacturing and distribution facilities are relocated in response. This is a surprising omission as recent events such as the dissolution of NAFTA and the US-China Trade War have seen companies move production and distribution facilities either from or to affected countries (Forbes, 2020; New York Times, 2020b, 2020a). This study aims to fill this gap in the Operations and Supply Chain Management literature by answering two questions: 1) *How do geopolitical disruptions impact the manufacturing SC location decision of MNC?* And; 2) *what are the drivers of the manufacturing SC location decision for MNCs in response to geopolitical disruption?*

### 3. Research Design

The research design is based on an abductive, theory elaboration approach (Ketokivi and Choi, 2014). To elaborate on theory, we examined the key concepts of the eclectic paradigm within a novel context (Ketokivi and Choi, 2014) – managerial decision-making during a significant geopolitical disruption (Brexit). We paid particular attention to the unique characteristics of the research context; when the tenets of the eclectic paradigm did not readily explain the findings that emerged from the data, we were able to arrive at new theoretical insights. Generalisability of the findings was achieved by developing a framework and series of propositions that explain the location decision-making process in the context of geopolitical disruption, applicable across companies and industries. The unit of analysis is the manufacturing SC location decision, while the context of the study is Brexit and its effect on the location of SC assets (production facilities, suppliers and DCs). Brexit was selected as the context of the study because it affects many aspects of a UK company's SC from the positioning of SC assets, material and information flows, human resource availability and access to suppliers (Hendry et al., 2019; Roscoe et al., 2020). Within the UK, 47% of goods exports and 55% of goods imports are with the EU, resulting in the UK being vulnerable to trade-related risks with other EU Member States (Chen et al., 2017). However, the study only considers the relocation of production, suppliers and DCs within Europe and the UK. Additionally, our study is not concerned with where the companies are originally registered, but focuses on the direction of the shift, with respect to the focal country – the UK. Therefore, moving part of or an entire manufacturing or distribution facility from the UK to the EU is considered offshoring; the reverse is reshoring.

#### 3.1 Data Collection and Analysis

The Delphi approach was chosen to collect data as this technique is particularly suitable for exploratory enquiries on under-researched, complex and interdisciplinary topics (Grisham, 2009). Use of the Delphi technique is appropriate when the issue under investigation does not lend itself to precise analytical techniques, but can benefit greatly from subjective judgements on a collective basis (Buckley, 1994). Delphi studies are conducted over multiple rounds to collect, structure, and analyse information on the research problem in order to build consensus (Häder, 2009). The participants remain anonymous to each other and interact with the researchers only (*ibid.*).

The Delphi started in December 2018, and the fourth and final round was completed in November 2019. It thus captures an opinion building process across approximately one year prior to Brexit being enacted on 31 January 2020. The detailed methodological steps and

decisions followed the processes and guidelines established by Reefke and Sundaram, (2017, 2018). Figure 1 outlines the key dates of the Brexit timeline in relation to the research steps performed. The study was positioned in the changing environment of the Brexit process in order to capture the SC location decision-making process in relation to the uncertainty surrounding Brexit and its implications.

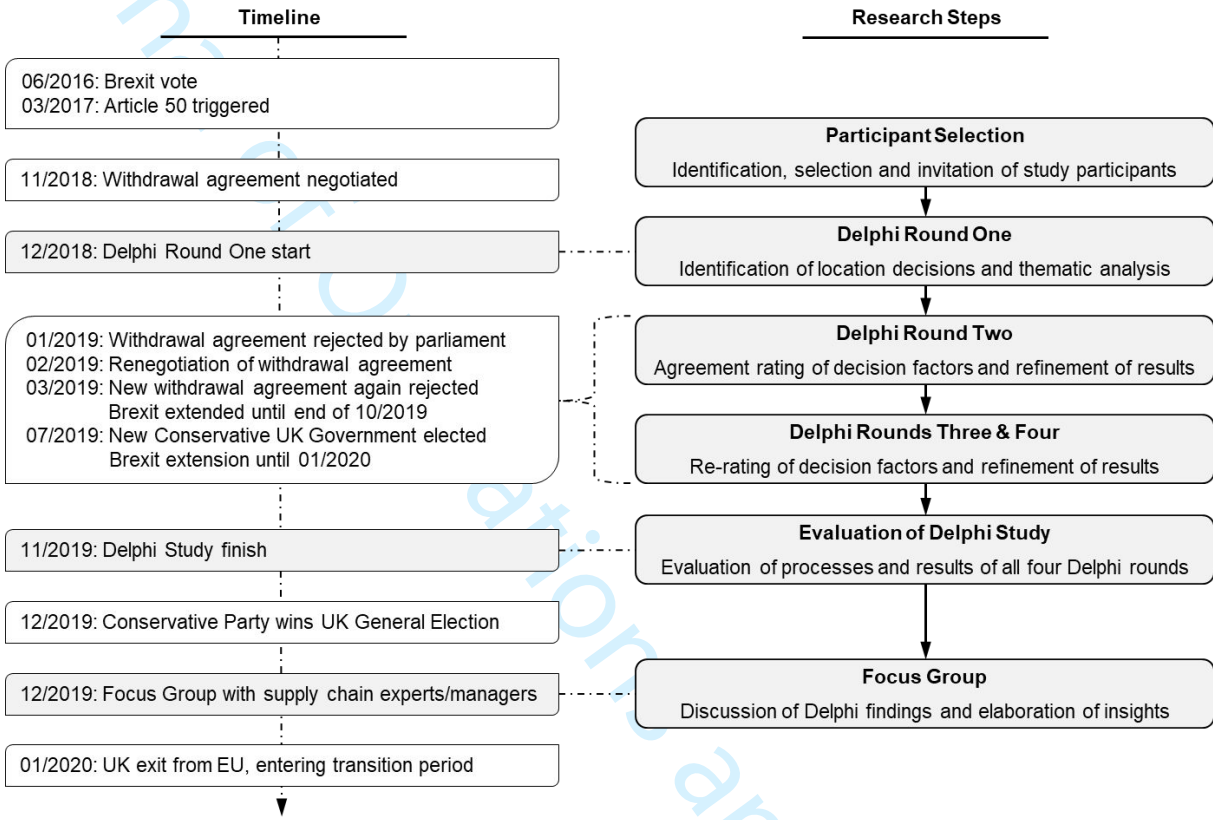


Figure 1: Brexit timeline and sequence of research steps

3.2 Context of Study: Brexit Process

On 23 June 23 2016, the UK voted in favour of leaving the EU. At the time, the UK was the second largest exporter of goods to EU Member States at €217.5bn and the third largest importer of goods at €269.2bn (EU Commission, 2019). Cumming and Zahra (2016) state “Brexit is a monumental event that is likely to have serious consequences, raising challenges while creating international business and entrepreneurship opportunities for companies around the globe”. The pro-Brexit vote was expected to have a number of detrimental effects on UK businesses, including a drop in Foreign Direct Investment (FDI), new tariff and non-tariff barriers, and uncertainty surrounding the future trading relationship. The UK exiting the single market is expected to reduce the attractiveness of the UK as an export platform due to an increase in cost from tariff and non-tariff barriers when exporting to the rest of the EU



(Dhingra et al., 2016a,b). Brexit is also expected to increase the SC complexity of MNCs and impact the coordination costs between their headquarters and local branches (Moradlou et al., 2021). Moreover, the uncertainty surrounding the future trade arrangements between the UK and the EU has already adversely affected the level of FDI in the UK (*ibid.*). Therefore, the magnitude of the economic decline is largely dependent on the trade negotiation between the UK and the EU, and the UK's post-Brexit economic relations (Dhingra et al., 2018; Dhingra, 2019). The timeline in Figure 1 shows that, during the 12-month period of the Delphi study, the level of uncertainty surrounding the Brexit process remained at a heightened level as the withdrawal agreement did not have parliamentary support and the deadline for exiting the EU was repeatedly delayed.

### 3.3 Delphi Panel Selection

The research questions outlined in the introduction point towards the exploratory nature of this study. In order to get an overview of potential SC location decision variables in response to Brexit, the Delphi panel needed to consist of informed individuals in possession of varied information, i.e., from diverse backgrounds including affected stakeholders and domain experts (Rowe et al., 1991; Scheele, 2002). Therefore, this Delphi considered the inclusion of panel members from several applicable backgrounds (Table 1) in order to obtain wide-ranging insights and opinions. Whilst members of the 'Manager Panel' primarily contributed by reflecting on their industry specific expertise, the 'Expert Panel' members supplemented and extended these insights through their work experience across various SC activities and actors. Table 1 provides the organisational background of all panellists and further, the organisational headcount and details on the geographical dispersion of the managers' organisations. It is evident that all organisations have operations (first tier suppliers, manufacturing locations, and distribution centres) either in both the UK and the EU, or a wider network across the UK, EU, and additional international locations.

The goal was to create a representative panel with the required expertise to answer the research questions, supported by objective inclusion criteria for panellist identification and selection. Initially, 65 potential participants were identified and invited based on the following criteria: 1) a demonstrated track record in professional and/or academic practice and continuing professional interest; 2) substantial experience in SC management and/or location decisions evidenced through employment in applicable organisational contexts and/or relevant publications in well-regarded publication outlets. As a result, the panel consisted of representatives from a range of key industries, consultancies, governmental organisations, and

academia. A total of 30 respondents participated in four iterative rounds of data collection with only small deviations in the total number of respondents per round (as shown in Table 1). The total number of respondents is in line with accepted recommendations for Delphi panel sizes (Ludwig, 1997).

Table 1: Delphi panellists and organisations

Panel	Organisation type	Round 1	Round 2	Round 3	Round 4
Expert	Professional, scientific, and technical activities	7	9	8	8
	Education	7	6	6	6
Manager	Manufacturing	9	9	7	6
	Transportation and storage	2	2	2	2
	Other service	3	4	4	4
Total:		28	30	27	26

Manager Panel Details		Round 1	Round 2	Round 3	Round 4
Organisational headcount	0-9	1	1	1	1
	50-249	1	1	1	0
	250+	12	13	11	11
Geographical dispersion	UK, EU	5	5	4	5
	UK, EU, Global	9	10	9	7
Total:		14	15	13	12

All identified panellists were invited to participate in rounds one and two but only respondents from the second round were considered for inclusion in rounds three and four in order to ensure a consistent rating process. Attrition effects are common in multi-round studies but were minimal in this Delphi; this can be interpreted as a characteristic of highly motivated and engaged respondents. Therefore, the exploratory first round and all consecutive rating-oriented Delphi rounds were supported by a consistent panel.

3.4 Delphi Round One

The first round was based on several open-ended questions, allowing the participants to provide their opinions precisely; it also supported the elicitation of rich information. The following questions were posed:

1. Are you aware of any manufacturing facility relocation decisions being taken in the UK/EU as a result of Brexit?
  - If the decision is to relocate, what operations are being relocated, and where are they geographically moving from and to?
  - Whatever the decision (no change or relocation), what are the drivers/reasons for these decisions?



2. Are distribution centre/warehouse relocation decisions being taken as a result of Brexit?
  - If the decision is to relocate, what operations are being relocated and where are they geographically moving from and to?
  - Whatever the decision (no change or relocation), what are the drivers/reasons for these decisions?
3. Are companies re-selecting their suppliers as a result of Brexit?
  - If suppliers are being re-selected, where are they geographically moving from and to?
  - Whatever the decision (no change or re-selection), what are the drivers/reasons for these decisions?

Study participants were encouraged to provide as many suggestions as possible together with descriptions and justifications. The analysis process of the data obtained in round one followed a structured process shown at the top of Figure 2.

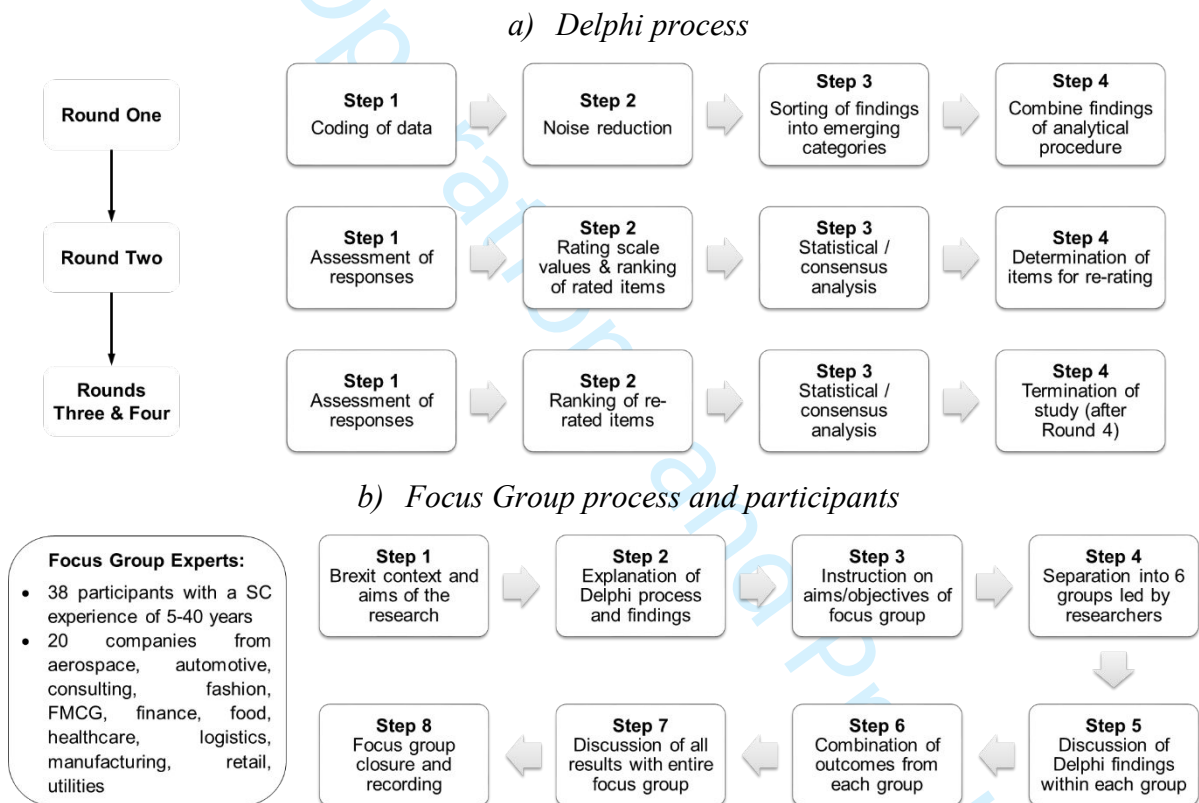


Figure 2: a) Analysis process of the Delphi rounds, b) Focus Group process and participants

First, the data were coded according to each participant, date and time of the response, and question number. Next, extraneous information was reduced by concentrating the data on information that is directly relevant to the research questions and study objectives. The resulting insights were sorted into categories following a bottom-up analysis. Finally, findings were compared across all open-ended questions to establish the structure of the next round of the Delphi.

### 3.5 Delphi Round Two

Supported by pilot tests with questionnaire specialists, the second round questionnaire contained 38 items for rating. To isolate different 'shoring' options, we investigated two dimensions based on geographical (offshore versus onshore) and governance (outsource versus insource) mode, as described in the literature review (Tate and Bals, 2017). Therefore, there were four selection options for both the manufacturing facility and DCs locations. The study participants were encouraged to suggest additional items and provide comments. Five-point scales (1 - strongly disagree to 5 - strongly agree) were used to rate the level of agreement with the 38 items put forward. The scales are unbalanced, i.e., they include a neutral response option in order to increase stability and internal consistency and prevent biased results. The numerical values were assigned to the rating options of the agreement scale so that the level of consensus reached for each item could be determined using unbiased statistical measures. In line with recommendations from the literature (Reefke and Sundaram, 2018), a consensus is established if 51% of responses fall within the same rating of the five-point scale and if 80% of responses are within two joining rating options. Following this process, round two resulted in a consensus for 16, out of 38, rated items.

### 3.6 Delphi Rounds Three and Four

The third and fourth round questionnaires included items without sufficient consensus in order to gather further validation and comments. Relevant additional items that had been suggested by the participants in round two were also included. Apart from new drivers, these suggestions resulted in an assessment of sectors that are likely to be affected by Brexit. Figure 3a provides an overview of all rounds with regard to the initial items carried over from the preceding round, additional items suggested, and items that achieved a consensus. Feedback from preceding rounds (aggregated panel assessments) was provided in a visual format, i.e., aggregated ratings and the spread of responses were conveyed by including graphs of the distribution of responses for each rated item. The analysis for rounds three and four (Figure 2) followed the same processes as round two but also considered whether the Delphi should be terminated. For this study the researchers continued the Delphi until no further insights could be gained, i.e., when a suitable convergence of opinions was reached for all items after the fourth round.

### 3.7 Evaluation of the Delphi Process

The Figure 3a shows the total number of items where consensus was achieved. In addition, the consensus building process is illustrated by plotting the respondents' average deviations from the panel's mean responses in a preceding round against the respondents' average deviations

between their ratings in consecutive rounds, i.e. Delphi rounds three and four (Reefke and Sundaram, 2017, 2018). Figure 3b shows how the panel members adjusted their answers from preceding rounds by about the same amount as their consecutive round ratings deviated from the average responses. The analysis did not reveal significant differences in opinion between managers and experts. These figures illustrate the desired group evaluation and convergence effect that is inherent to Delphi studies, thus supporting termination after four rounds.

*a) Delphi items and consensus across rounds*

	Initial items	Additions	Consensus achieved
<b>Round 2</b>	38 (+8)	-	16
<b>Round 3</b>	30	36	42
<b>Round 4</b>	24	-	20
<b>Total</b>	<b>82 items overall</b>		<b>78 achieved consensus</b>

*b) Consensus building process – Rounds 2 to 4*

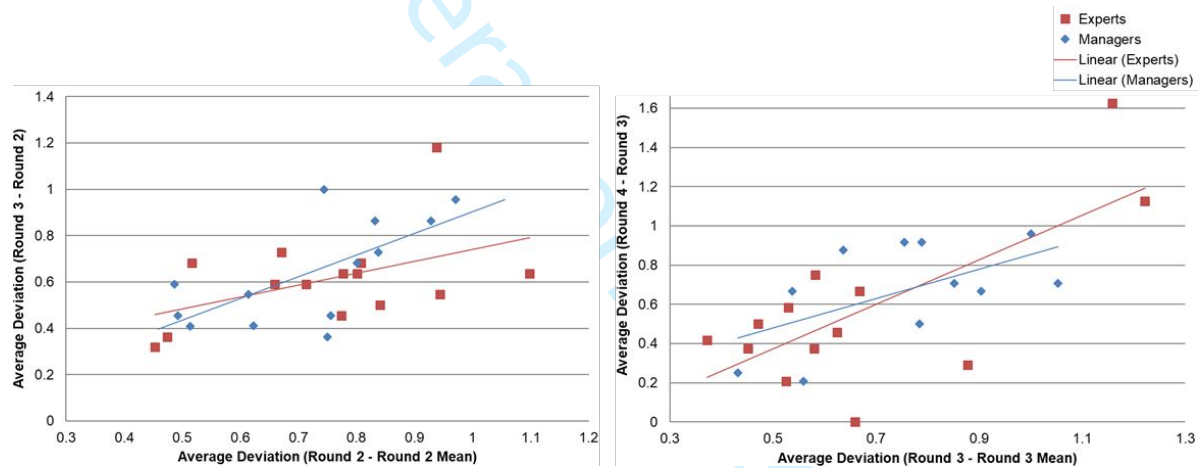


Figure 3, a) Delphi items and consensus across rounds, b) Consensus building process – Rounds 2 to 4

### 3.8 Focus Group

The findings from the Delphi study were validated using a focus group that consisted of 38 experienced practitioners from a wide range of industries with physical SCs. The characteristics of the participants are detailed in Figure 2b. This focus group was conducted as part of an all-day event that was scheduled at quarterly intervals for industry members of a research club at a leading UK university. The theme of the meeting was ‘Brexit’, which hence supported the focus group discussion topic.

The aims for the focus group were the confirmation of items identified and ratings obtained in the Delphi with an emphasis on the extremes (high/low levels of agreement) and

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an elaboration of their applicability to different industry/SC contexts. The focus group process, as outlined in Figure 2b, offered comments and feedback that corroborated the evidence collected through the Delphi study. No additional items were identified but the Delphi findings underwent validation and their applicability was reinforced by the focus group. The potential application of the findings to different industries was discussed by this cross-sector group and the sector-related findings were supported.

#### 4. Findings

The Delphi study provided consensus across 78 out of the 82 survey items and supporting qualitative data from the participants. From the Delphi round 1, in January 2019, it was evident that companies had initiated preliminary discussions with respect to the location of their operations leading to planning ahead of Brexit deadline while some had already started the relocation process. For instance, a Vice President of a third party logistics company commented on the relocation of a clinical trials manufacturer to Ireland:

“We have seen clinical trials manufacturers move stocking points into Ireland to ensure continuity of long term pharma trials in the event of a hard Brexit” *Vice President Operations – Practitioner*

Similarly, a Partner and Head of Manufacturing stated that:

“I have a manufacturer who employs a significant number of EU workers. Over the last few years they have been slowly moving back to Eastern Europe (partly because of Brexit and partly because the Eastern European economies have strengthened and the value of the GBP fallen). They have taken the decision to set up a manufacturing plant in Brno, CZ Republic, in order to remain price competitive” *Manufacturing Partner - Practitioner*

The above statements are further supported by an expert from the Chartered Institute of Logistics and Transport in the UK, stating that:

“For industry trade body members and the organizations they represent who are involved in international SCs, many have been planning for disruption for a considerable period with one major manufacturer reporting that they have had a team of 20 people working on options since mid-2016”. *CEO CILT - Expert*

Similarly, a trade policy expert mentioned that “for price sensitive products, companies are actively investigating alternative suppliers due to tariffs and Country of Origin rules” (*Trade Negotiations and Trade Policy Advisor, Expert - consultant*). However, the sheer amount of uncertainty surrounding the regulatory landscape in the UK, at this early stage, appeared to make definite decision making challenging for many companies. One expert argued that:

“Wider macro impacts - e.g. Japan’s trade deal with the EU, has exacerbated the issues around the ‘attractiveness’ of the UK as a manufacturing location to access the EU market. Complex platforms like Airbus, which were intrinsically linked to the European project, with modules manufactured in different countries - are under review to establish if maintaining operations in the UK after Brexit still makes sense”. *Associate Professor – Academia*

A practitioner highlighted the issue related to high levels of uncertainty by stating that Brexit has caused the deferment of FDI in the UK:

“The deferment of a decision on Brexit is having impact on Foreign Inward investment to the UK. Companies are deferring decisions on investing or setting up in the UK”  
*Vice President, Global Account Management- Practitioner*

As the Brexit deadline came closer, our data showed a significant consensus on companies’ mitigation strategies. The findings indicate that Brexit led the vast majority (88%) of MNCs in our study to offshore their production to mainland Europe whereas only 12% brought facilities to the UK. Such decisions were being made well in advance of the trade negotiations being settled between the UK government and the EU, as supported by this statement:

“I think we have seen a trickle of relocation decisions being made prior to Brexit; however, I see this turning into a flood if the UK fails to have easy access, not only to the EU but other major countries that it currently exports to under current EU agreements. I have little confidence that the UK Government will be able to negotiate suitable trade agreements needed to continue to make the UK an attractive place to retain its manufacturing base or attract inward investment in the future”. *Associate Professor – Academia*

The relocation decision was also triggered by “Country of Origin” rules, as explained by an expert participant:

“Country of origin (non-preferential and preferential) of final items depends on origin of components/ingredients etc. For those in the know, this is driving some of these location and supply decisions, because if they increase the ‘British’ content they will gain British origin and take advantage of any trade deals the UK does post Brexit” *CEO CILT - Expert*

The results of the Delphi study indicated that Brexit was likely to lead to DCs being repatriated to the UK for manufactured products supplied to the UK market (80%). However, the e-commerce sector showed a different outcome, where DCs were moved out of the UK to the EU (12%). The move to offshore DCs to the EU was primarily because the 27 Member States represented a larger proportion of demand for these companies, which wanted to be closer to their customers, as explained by an expert participant:

“We have recently come across e-commerce companies that have grown up in the UK, expanded into the rest of the EU and now have over 50% of their demand from EU27. Some have taken the opportunity to review their operating model and look at



segregating UK and EU27 business, opening up new DCs in Poland, Czech, Slovakia with attached customer service centres. Brexit has spurred thoughts on trying to optimise these businesses post-Brexit, moving assets out of the UK leaving a UK footprint which is designed to cater for UK demand only, so the larger scale assets go into EU27". *Director, Expert - consultant*

Some additional points were also captured with respect to the timing of the companies' relocations plans. Some companies were planning to relocate as a result of Brexit, but not until the uncertainties were settled and there was more visibility on their total cost of operations. For instance, one practitioner mentioned that:

"More suppliers outside of the EU are winning business, mainly because they are committed to provide a service. Unfortunately, all EU suppliers are struggling to commit to long term contracts due to Brexit uncertainty." *Head of Logistics – Practitioner.*

This is further supported by two participants as follows: "Decisions on where to (re)locate manufacturing facilities are currently being delayed and investment decisions are being postponed" (*Director, Expert - consultant*); similarly "Securing and switching to alternative suppliers is not an option in the short- and/or medium-term" (*Head of Strategy and Supply Chain - Transportation and storage, Rail*). This finding suggests that the high levels of uncertainty surrounding Brexit are forcing some managers to act quickly, while leading to paralysis at other companies as they waited for the exact nature of the EU-UK trading relationship to be clarified.

#### 4.1 Industry Sectors

The findings revealed that the location decision was significantly influenced by industry factors. Automotive, pharmaceutical, food, healthcare and aerospace were found to be the top five industries most likely to be impacted in terms of changes to the location of manufacturing facilities, suppliers, and distribution facilities (Table 2). These five industries are considered strategically important sectors to the UK economy and account for the majority of UK-based manufacturing (UK Industrial Strategy, 2017)



Table 2: Industries where manufacturing, suppliers and DC locations are impacted to the greatest degree by Brexit

	Manufacturing	Average	SD	Suppliers	Average	SD	Distribution	Average	SD
1	Automotive	4.19	0.68	Automotive	4.11	0.64	Pharmaceutical	4.04	0.89
2	Pharmaceutical	4.12	0.93	Food	4.08	0.80	Automotive	4.00	0.83
3	Food	4.04	0.77	Pharmaceutical	4.04	0.89	Food	4.00	0.75
4	Healthcare	4.00	0.91	Healthcare	4.00	0.96	Healthcare	3.96	0.89
5	Aerospace	4.00	0.69	Aerospace	3.92	0.63	Aerospace	3.73	0.72
6	FMCG	3.92	0.40	Electronic	3.68	0.85	FMCG	3.58	0.76
7	Electronic	3.76	0.88	FMCG	3.62	0.75	Electronic	3.54	0.99
8	Fashion	3.08	0.98	Fashion	3.60	0.76	Fashion	3.35	0.94

As indicated in Table 2, the sector where SC locations are likely to be most impacted is the automotive sector. The following participant quote explains why automotive manufacturing locations will be moved from the UK:

“It is clear that a number of high profile announcements from producers, based in the UK, suggest that Brexit has at least some part in the decision to cease manufacturing in the UK. Three auto assemblers have recently stated a change in their UK manufacturing footprint giving multiple reasons for their decisions, e.g., decline in the Asian market, decline in diesel engine demand, etc. In my view, Brexit is part of a perfect storm that is leading some manufacturers to rethink their footprint”. *Professor - Academia*

The food SC is also likely to be critically impacted by Brexit; the following quote explains how supplier locations are being moved into the UK:

“Some suppliers are being changed as a result of ‘no deal’ mitigation planning. In food this has typically resulted in pulling supply into the UK where it is practical, e.g. fresh chicken being sourced in the UK instead of Poland. There is typically a limit to this activity, constraining how much this can be done due to price and UK capacity”. *Director, Expert - consultant*

The UK food industry experienced a considerable amount of stockpiling in the UK in anticipation of delays at border crossings post-Brexit, which can shorten the shelf life of perishable items. This point is explained in the following quote;

“The major change has been the major frozen food manufacturers with a global manufacturing and SC approach. They have built up stocks in anticipation of Brexit as a short-term approach to avoid stock outs caused by border delays. This has been at significant cost and expense, and a possible negative business process and profits effect on usual seasonal peaks and promotions like Easter”. *Principal, Director and Advisor – Expert, Governmental organisation*

In the healthcare sector, the location of manufacturing facilities was expected to be significantly impacted by Brexit, primarily due to new non-tariff barriers and changes to

regulatory regimes. One respondent explained the offshoring of distribution facilities in the healthcare sector as follows:

“We have noticed that medical device companies [Healthcare] who are serving their European market from the UK, are moving their European manufacturing volumes to the EU mainland, with the Netherlands, Belgium and Germany as preferred locations. There are increasing concerns about non-tariff barriers to trade between the UK and EU. This will require a high level of regulatory alignment between the UK and EU, especially with medicinal and industrial products”. *Supply Chain Consultant – Expert, Industry*

One commonality across these five industries is that they are heavily regulated by EU regulatory bodies such as the EU Aviation Safety Agency (EASA), the European Medicines Agency (EMA), and the European Food Safety Authority (EFSA). By leaving the EU, UK companies were likely to have more oversight from UK-based regulatory authorities.

#### 4.2 Drivers for Moving Manufacturing

The findings from the Delphi study revealed that the relocation of manufacturing SCs was motivated by several factors. Table 3 shows the drivers behind the shift in manufacturing location from the UK to the EU based on the importance assigned to them by the Delphi panel. It also shows the average value and standard deviations related to each factor. It should be noted that the research team received consensus on all the items listed in the table from the focus group session. The top five drivers for companies to move out of the UK were: access to the EU market; delays in product delivery due to new border controls; higher costs through new tariffs for imports/exports to the EU; access to international markets through EU trade deals; and favourable currency conditions. The bottom five factors influencing the relocation of manufacturing facilities to the EU were: lower cost of manufacturing in the EU; access to research and development (R&D); access to skilled labour; declining demand and unprofitable plants in the UK; and government incentives offered by EU countries.

We asked the Delphi participants for their views on drivers for keeping the manufacturing facilities in the UK and not moving them to the EU (Table 3). The top five drivers for keeping the production onshore were: proximity to customers in the UK; avoiding non-tariff costs (such as border delays and inventory levels) of importing to the UK; high cost of transferring operations; customer service agreements; and avoiding tariff costs of importing to the UK. The bottom five drivers were: lower cost of manufacturing in the UK; access to labour; UK R&D taxation regulations; possible removal and lowering of taxation; and UK government incentives.

Table 3: Ranked drivers for moving manufacturing (the top and bottom five drivers have been highlighted and labelled \*\*)

Drivers for moving manufacturing facilities						
	From the UK to the EU	Average	SD	Keeping production in the UK	Average	SD
1	Access to the EU market	4.22	0.8	Proximity to customers in the UK	4.00	0.6
2	Delays in product delivery due to new border control	4.03	0.5	To avoid non-tariff costs (such as border delays and inventory levels) of importing to the UK	4.00	0.5
3	Higher costs through new tariffs for imports/exports to the EU	3.97	0.7	High cost of transferring operations	4.00	0.5
4	Access to international markets through EU trade deals	3.93	0.6	Customer service agreements	3.96	0.3
5	Favourable currency conditions (exchange rates, stability, same currency trades, etc.)	3.92	0.3	To avoid tariff costs of importing to the UK	3.70	0.7
6	Proximity to customers in the EU	3.85	0.5	Access to R&D	3.69	0.5
7	Business consolidation with other facilities	3.81	0.5	Access to suppliers	3.57	0.7
8	Higher non-tariff costs, such as inventory levels, of import/export to the EU	3.77	0.7	Uncertain regulations (Customs arrangements)	3.54	0.6
9	Higher stability (political, financial, regulations, etc.) of the destination country	3.77	0.5	Government incentives offered by the UK**	3.42	0.5
10	EU approval procedures (e.g., for medicines/drugs) and respective access to market	3.74	0.8	Possible removal or lowering of taxation**	3.35	0.6
11	EU standard regulations	3.73	0.7	UK R&D taxation regulations**	3.31	0.6
12	Uncertainty and fear	3.70	0.7	Access to labour**	3.00	0.6
13	Uncertain regulations with respect to Customs arrangements	3.67	0.8	Lower cost of manufacturing in the UK**	2.85	0.7
14	Access to suppliers	3.63	0.7			
15	Market competition forces/encourages a move to the EU	3.59	0.6			
16	Government incentives offered by EU countries **	3.22	0.6			
17	Declining demand and unprofitable plants in the UK**	3.19	0.9			
18	Access to skilled labour**	3.19	0.6			
19	Access to R&D**	2.93	0.7			
20	Lower cost of manufacturing in the EU**	2.15	0.5			

The answers in Table 3 were seen as factors that could affect the smooth flow of products between the EU and the UK. However, at the time of the Delphi study, the respondents still did not know the exact nature of the future EU-UK relationship. One participant suggested:

“Companies involved in international e-commerce are considering how best to serve the market and considering the impact of potential border delays and Customs processing changes and costs. Organizations supplying into the UK from within the EU are assessing opportunities to set up operations in the UK for both fulfilment and returns processing”. *CEO - Expert industry trade body*

This quote suggests that companies were weighing the potential risks and making a decision based on incomplete information, as the EU-UK trade deal had still to be negotiated.

## 5. Discussion

The effects of geopolitical disruptions on SCs is a theme that is gaining increasing attention in the Operations and Supply Chain Management literature (Hansen et al., 2017; Hendry et al., 2019; Roscoe et al., 2020). So far, this emerging discourse has concentrated on risk management and mitigation strategies in the context of geopolitical disruptions. For example, the study by Hansen et al (2017) examines how political risks affect offshoring engagements; highlighting the need for managerial tools that improve the monitoring and identification of political risks. Hendry et al. (2019) study how local SCs prepare for and respond to the threats and opportunities presented by Brexit, and the resilience strategies that firms develop in response. A recent study by Roscoe et al. (2020) examines how pharmaceutical firms have managed the uncertainty arising from the pro-Brexit vote; identifying that multi-national companies use worst-case scenario planning, while smaller firms follow a wait-and-see strategy to reduce SC uncertainty. They suggest that firms will then implement reactive or proactive strategies to mitigate SC risks related to geopolitical disruptions (Roscoe et al. 2020). While informative, this body of literature is focused on the downsides of geopolitical disruptions, explaining how companies mitigate the negative repercussions of risk and uncertainty through better planning, collaboration, and the building of SC redundancies.

The present study takes a different approach; examining geopolitical disruptions through the lens of the OLI framework and the manufacturing location decision making process. The findings reveal that companies move production and distribution facilities due to location advantages as well as disadvantages. Delphi respondents planned or actually moved facilities to maintain access to the EU market or to be in proximity to their UK customers (see Table 3). Companies also sought out locations that had favourable currency conditions as well as access to international markets through EU trade deals. The perceived advantages of relocating production and distribution facilities were evenly ranked with the disadvantages, which included the costs associated with new tariff and non-tariff barriers and delays at border crossings (see Table 3). This study therefore contributes to the emergent discourse on geopolitical disruption in the Operations and Supply Chain Management literature by finding that managers consider both location advantages and disadvantages during the manufacturing location decision making process.

Indeed, the majority of Delphi study participants stated that offshoring and reshoring decisions were based primarily on location, as opposed to ownership and internalisation, advantages. This finding reinforces the importance of a country's attractiveness for the

relocation of production activities, as stated by Ellram et al. (2013) and Kinkel (2012). Specifically, our analysis indicates that companies were more inclined to change only the geographical dimension of their operations (Tate and Bals, 2017) and retain the same governance mode of production after relocating facilities. Our findings suggest that internalisation advantages did not play a significant role in decision making as the operations remained primarily in-house. At the same time, the ownership advantages appeared to play a marginal role as companies did not consider expanding their operations and were already present in the UK market. In other words, companies were not planning to outsource production but would continue utilising existing internal capabilities (Dunning, 2015).

This leaves the L advantage that suggests that MNCs make their location decision according to ease of access to new markets, availability of talented labour and cost efficiencies. An early study of Britain joining the European Common Market (ECM) by Dunning and Archer (1987) indicated that all three OLI advantages were apparent for UK MNCs in deciding where to locate production, including ownership and governance mode (insourcing/outourcing). Dunning and Archer (1987) perceived of the MNC as an external entity that made foreign direct investments (FDI) to exploit new market opportunities. Today, however, MNCs are better conceptualised as the focal orchestrators of globalised SCs (see Dunning, 2015). This means that while production facilities may be located in the UK or the EU, these facilities receive inputs from suppliers all over the globe, making the movement of goods across borders a greater priority than potential FDI opportunities. Since the late 1980s, the UK has become ever more dependent on the European market with 45% of imports and 52% of exports moving between the UK and the EU (Safonovs and Upadhyay, 2017). Responses to our Delphi study indicate that companies were primarily interested in maintaining the smooth flow of goods between the UK and the EU and would relocate production to ensure supply continuity and market access. These location factors were prioritised over governance mode, with little evidence in our study of companies considering outsourcing or purchasing goods on the market. This leads us to propose that:

P1: During geopolitical disruption, the location advantage (rather than ownership or internalisation advantages derived from the governance mode) is the primary driver for the relocation of production.

Recent contributions to the eclectic paradigm treat government policy as a facilitator of resource-seeking advantage, in terms of providing infrastructure, market-seeking advantages in terms of providing market access, and efficiency-seeking advantages by providing incentives



such as tax breaks and subsidies (Dunning, 2015; Dunning and Lundan, 2008). By examining how MNCs responded to Brexit, it becomes apparent that uncertainty related to government policy acts as a primary influencing factor for relocating production. This is an important finding because the eclectic paradigm considers uncertainty in relation to internalisation factors, where heightened uncertainty, in combination with opportunism (Williamson, 1987) and bounded rationality (Simon, 1991), will lead to hierarchical governance modes (Dunning, 2015). Instead, our findings suggest that policy related uncertainty has a greater bearing on the location, as opposed to the internalisation, aspect of the OLI framework. There still exists an implicit assumption in the OLI framework (Dunning, 2015) that managers work with perfect information in situations of pure certainty when deciding on the ideal location for production. This is an interesting assumption because organisational behaviour scholars (March and Shapira, 1987; Simon, 1991) have long argued that boundedly rational managers must often make decisions with imperfect information in short time frames under conditions of heightened uncertainty (March and Shapira, 1987; Simon, 1991).

Our data suggest that, early in 2019, managers had already planned or made the decision to offshore manufacturing facilities to the European mainland, or to re-shore facilities to the UK, a full year before the UK officially left the EU. MNCs were not considering new governance modes to mitigate uncertainty, such as outsourcing or purchasing on the market; instead they continued with internalised production and relocated facilities. At this point, the exact nature of the EU-UK trading relationship had not been negotiated, and a “no-deal” Brexit was a very real outcome of the talks. As it takes years for facilities to be built and gain regulatory approval, such decisions needed to be made early-on, regardless of whether policy outcomes would help or hinder cross-border trade. In 2019, managers could only have predicted increased costs that may, or may not, arise from new tariff and non-tariff barriers. At this time, managers did not have a complete understanding of what the actual production costs would be in Europe post-Brexit and whether any government incentives would be in place to encourage offshoring/reshoring.

This finding indicates that a primary influencing factor for the location decision is high levels of policy-related uncertainty, with managers making decisions based on incomplete information within limited timeframes. Our findings therefore suggest that the ‘shoring’ decision is not simply driven by costs, resource availability and government incentives; instead, the manufacturing SC location decision is constrained by a manager’s bounded rationality and influenced by perceptions of heightened uncertainty. This finding lends empirical support to earlier propositions made by Gray et al. (2013) and Ellram et al. (2013) that government policy

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is a primary influencing factor on the location aspect of the OLI framework, and must be considered in addition to efficiency and market seeking advantages. This leads us to propose that:

P2: During geopolitical disruptions, the manufacturing SC location decision is constrained by a manager’s bounded rationality and is influenced by perceptions of heightened uncertainty related to government policy.

Our Delphi study participants expected future government policy decisions to negatively affect market access (either UK or EU), to increase costs due to new import/export tariffs and to delay product delivery due to new border controls. The reasons that managers gave for relocating manufacturing and distribution facilities can be better understood according to what Dunning (1998) suggests are the four variables driving the location of value added activities by MNCs: resource-seeking, market-seeking, efficiency-seeking, and strategic asset-seeking advantages. Table 4 provides a comparison of our findings from the Delphi study and focus group with Dunning’s four motivating factors of international production.



Table 4: Relationship between the Eclectic Theory location advantages and drivers behind Brexit relocations (the top and bottom five drivers have been highlighted and labelled)

<i><b>Eclectic Paradigm</b></i>	<i><b>Drivers for relocating manufacturing to the EU</b></i>	<i><b>Drivers for keeping production in the UK</b></i>
<i>Resource-seeking advantage</i>	-Access to R&D**	-Access to R&D
<i>Market-seeking advantage</i>	<b>-Access to international markets through EU trade deals</b> <b>-Access to the EU market</b> -Market competition forces/encourages a move to the EU -Proximity to customers in the EU -Higher stability (political, financial, regulations, etc.) of the destination country -EU standard regulations -Uncertain regulations with respect to Customs arrangements -EU approval procedures (e.g., for medicines/drugs) and respective access to market -Access to suppliers -Uncertainty and fear -Declining demand and unprofitable plants in the UK** -Access to skilled labour**	<b>-Proximity to customers in the UK</b> <b>-Customer service agreements</b> -Uncertain regulations (Customs arrangements) -Access to suppliers -Access to skilled labour**
<i>Efficiency-seeking advantage</i>	<b>-Higher costs through new tariffs of import/export to the EU</b> <b>-Delays in product delivery due to new border control</b> <b>-Favourable currency conditions (exchange rates, stability, same currency trades, etc.)</b> -Higher non-tariff costs, such as inventory levels, of import/export to the EU -Business consolidation with other facilities -Lower cost of manufacturing in the EU** -Government incentives offered by EU countries**	<b>-To avoid non-tariff costs (such as border delays and inventory levels) of importing to the UK</b> <b>-To avoid tariff costs of importing to the UK</b> <b>-High cost of transferring operations</b> -Lower cost of manufacturing in the UK** -Government incentives offered by the UK** -UK R&D taxation regulations** -Possible removal or lowering of taxation**
<i>Strategic asset-seeking advantage</i>	None	None

The findings from the Delphi study revealed that market-seeking and efficiency-seeking advantages were the primary drivers of the manufacturing SC location decision (see Table 4). The market-seeking advantages for UK-based firms relocating manufacturing to the EU included having access to the larger EU market and having access to international trade deals negotiated between the EU and third countries. For UK-based companies, the primary drivers for keeping production in the UK were proximity and ease of access to UK customers, and maintaining customer service advantages. The efficiency-seeking advantages of UK-based firms considering relocating manufacturing to the EU were related to expectations of increased costs from new import and export tariffs as well as expected border delays resulting from new customs clearance procedures. Another important factor was a desire to avoid currency fluctuations associated with having facilities in the UK and selling in the EU, where moving facilities to the EU would negate exchange rate fluctuations. Managers considering keeping production in the UK also felt that avoidance of tariff/non-tariff barriers were the primary efficiency-based advantages for avoiding the high cost of transferring operations.

These findings support the Ellram et al. (2013) propositions that suggest the movement of manufacturing facilities to other geographic regions tends to change according to government trade policies. In other words, for a country to be viewed favourably by companies, there needs to be attractive policies, including tax advantages, subsidies, and countertrade requirements. This is further elaborated by Mann (2012) in terms of economics and policies of trade facilitation, including international trade negotiations: “improvements in trade-facilitation metrics improve the environment in which businesses engage in the global SC, and through those individual business decisions increase a country’s international trade”. In the context of Brexit, Kotios and Braithwaite (2017) reiterate that different WTO tariff structures, such as tariff and non-tariff charges for different industries (e.g., food versus automotive sector), will influence the relocation of manufacturing and distribution facilities. Similar to these studies, we found the expected imposition of new tariff and non-tariff barriers acts as a significant driver of the relocation of production between the EU and the UK.

Dunning’s eclectic paradigm suggests that resource-seeking and strategic asset-seeking advantages also play an important role in the relocation decision (Dunning, 1998). However, the Delphi study participants did not mention these two advantages as primary drivers for the relocation of production. For resource-seeking advantages, this is likely because MNCs, as orchestrators of global SCs, utilise raw materials from overseas locations (outside the EU and the UK), meaning that the relocation of production does not bring companies closer to the source of material supply. Also, the physical infrastructures of the UK and the EU are broadly

similar, meaning relocating production would not provide immediate infrastructure advantages. Regarding strategic asset-seeking advantages, while knowledge-related assets may be different between the EU and the UK, this was not cited as a major reason for relocating production. This is an interesting finding because restrictions to the free movement of labour, including the movement of highly qualified staff, were expected following the UK's departure from the EU.

It is important to reiterate that the managers in our study were making relocation decisions based on perceptions of new regulatory barriers, including tariff and non-tariff barriers, without knowing exactly what form these impediments would take. Despite the great level of uncertainty about future tariff rates, our study identified that companies tend to be proactive and start the preparations for relocation of their facilities as a risk mitigation strategy. This finding is in contradiction to a study by Kinkel (2012); that study asserts that the higher the uncertainty of the economic environment, the lower the degree of organisational and spatial separation between facilities. Our study suggests the opposite; when geopolitical disruptions lead to high degrees of uncertainty, production will be relocated based on perceived efficiency- and market-seeking advantages, as opposed to perceived resource- and strategic asset-seeking advantages. This leads to the following proposition:

P3: When geopolitical disruptions lead to situations of high uncertainty, companies are likely to relocate production due to perceived market-seeking and efficiency-seeking advantages, as opposed to resource-seeking and strategic asset-seeking advantages.

According to Table 4, the least important drivers for moving facilities include government incentives, access to labour, and lowering the cost of production. These findings contradict McIvor's (2013) argument that individual firms will tend to move away from higher cost to lower cost regions, all things being equal. Our findings also partially contradict MacCarthy and Atthirawong (2003) who state that the first motivation for firms to move manufacturing is access to cheap but skilled labour. Our findings are more consistent with the proposals of Ellram et al. (2013) that SC-related factors, such as continuity of supply and market access, are becoming more imperative in manufacturing location decisions, as opposed to looking solely at the cost of production. Indeed, the efficiency-seeking advantages mentioned by our Delphi study respondents are not wholly related to cost factors. The Delphi panel expressed the view that the expected imposition of tariff and non-tariff barriers between the EU and the UK would impact the smooth flow of goods and affect customer service levels. Dunning's explanation of efficiency-seeking advantages is that firms will consider the

relocation of production when governments eliminate obstacles to economic activity (Dunning, 1998). In the context of geopolitical disputes, we found that governments were actually putting obstacles in the way of free trade, disrupting the smooth flow of goods between nation states. Therefore, our findings suggest that efficiency-seeking advantages can also be related to the avoidance of barriers to trade and maintaining the smooth flow of goods between suppliers, focal firms, and customers. This leads to the following proposition:

P4: During geopolitical disruptions, the relocation of manufacturing SC facilities is primarily driven by ease of access to markets and maintaining the smooth flow of goods across the SC.

We now advance a managerial framework of the manufacturing location decision-making process in the context of geopolitical disruptions (Figure 4). The purpose of the framework is to show the relationship between the four propositions while providing managers with a roadmap for the manufacturing location decision-making process. First, the framework shows that location advantages are the drivers of the offshoring/onshoring of production and distribution facilities, as opposed to ownership and internalization advantages (Proposition 1). Second, the framework suggests that there are implicit factors influencing the decision-making process including high degrees of uncertainty, imperfect and incomplete information and tight deadlines for decision making. These factors constrain the decision-making process and lead to bounded rationality when managers are deciding whether to relocate production and distribution facilities (Proposition 2). The primary location advantages for relocating facilities include market-seeking advantages, such as being close to major centres of demand and benefiting from new trade agreements as well as efficiency seeking advantages related to minimizing costs from new tariffs and border delays (Proposition 3 and 4). The framework suggests that resource seeking and strategy seeking advantages will play a secondary role in the location decision-making process. These factors culminate in three possible location decision options for managers including: 1) Move production and/or distribution facilities offshore; 2) Reshore production and/or distribution facilities or; 3) Wait until the exact nature of the geopolitical disruption is known (see Figure 4).

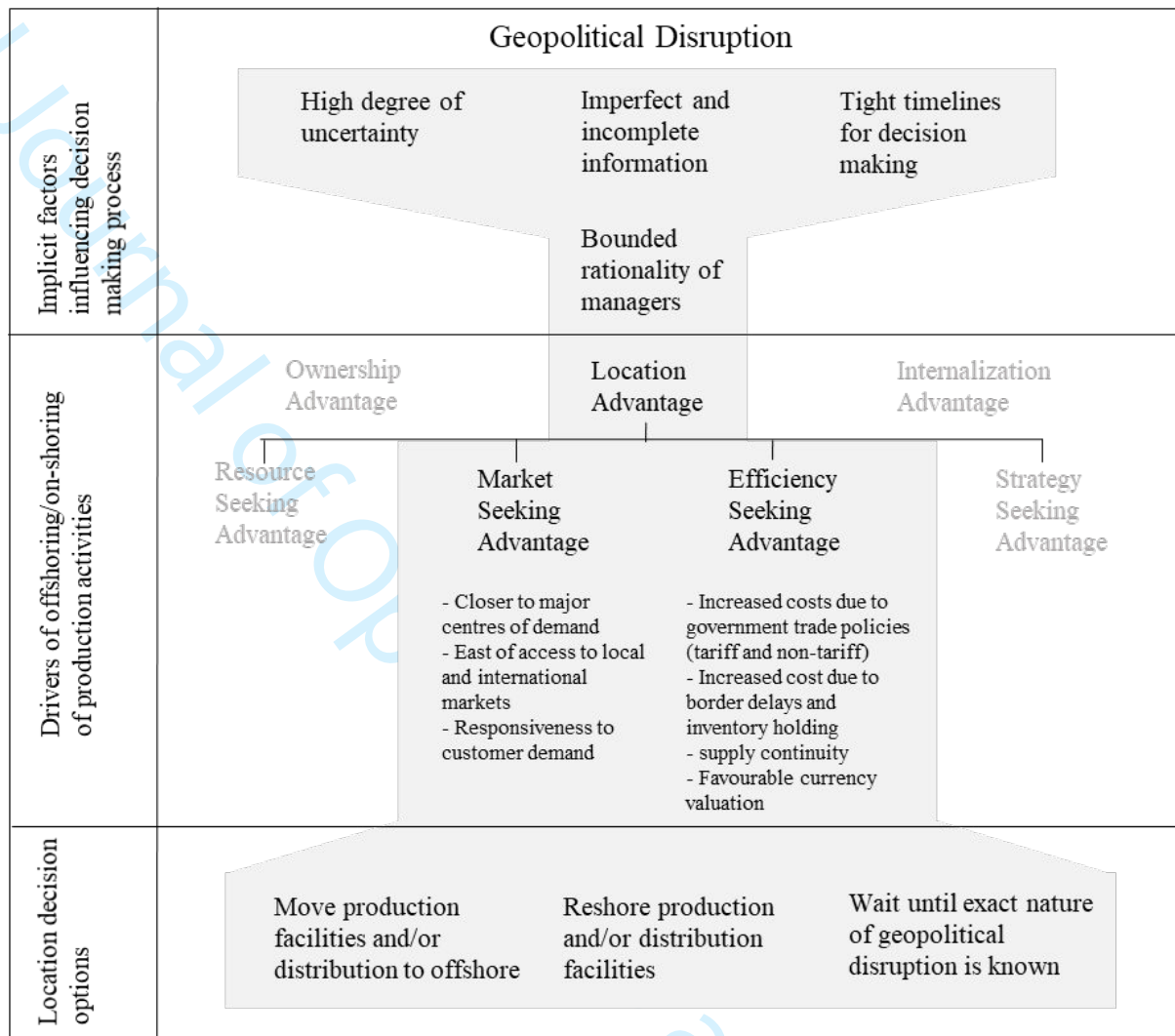


Figure 4: Managerial framework for the manufacturing location decision-making process in the context of geopolitical disruptions

## 6. Conclusions

### 6.1 Theoretical Implications

Recent contributions to the eclectic paradigm have made the OLI framework relevant to supply chain scholars by conceptualising MNCs as the lead orchestrator of a complex global SC (Dunning, 2015; Dunning and Lundan, 2008). The location of production is no longer based solely on maintaining in-house capabilities through ownership advantages or reducing transaction costs by internalising production. The OLI framework now argues that the location of SC assets can be motivated by knowledge seeking advantages where firms take advantage of innovation residing with suppliers at key nodes in the SC (Dunning and Lundan, 2008). While recent extensions to the OLI framework are welcome, our study has revealed several shortcomings in the framework, on which we intend to provide new theoretical insights. Our study is one of the few to investigate the manufacturing SC location decision during a major geopolitical disruption. By studying the phenomenon of Brexit as it occurred, our study offers important contributions to the eclectic paradigm and theory of international production.

First, the OLI framework considers uncertainty in relation to internalisation factors, where heightened uncertainty leads to hierarchical governance modes (Dunning, 2015). However, the framework does not consider how geopolitical disruptions create situations of heightened uncertainty that in turn influence the location advantages outlined in the framework. Our findings suggest that Brexit, as a major geopolitical disruption, created heightened uncertainty for managers, who decided to relocate facilities to mitigate uncertainty, years in advance of any deal being negotiated between the UK and the EU. Managers indicated that they would move facilities even despite the high costs, and even when a favourable deal was still a very real possibility. At the same time, managers did not discuss uncertainty as influencing the governance mode, where companies still planned to keep production in-house and were not looking to outsource or transact via markets. This finding contributes to the OLI framework by showing that policy-related uncertainty is a primary influencing factor on the location aspect of the framework, outweighing the importance of uncertainty as an influencer of internationalisation factors.

Second, the OLI framework considers managerial cognition and bounded rationality with regards to internalisation factors and governance mode, but not location aspects. Recent contributions to the OLI framework still implicitly assume that managers have perfect information and make decisions under conditions of uncertainty when considering location advantages. Our findings challenge this assumption, as Brexit presented managers with



situations of heightened uncertainty with extremely limited information on the actual trading relationship between the UK and the EU. As facilities take years to build and gain regulatory framework, managers had to make decisions immediately using a series of assumptions on the likely outcomes of the negotiations. At the same time, we did not find evidence that limited information or short time scales acted as a motivator for changing the governance mode. This finding contributes to the OLI framework by showing how managerial cognition and bounded rationality influence the L aspect of the OLI framework, as location decisions are made in tight time frames with imperfect information under conditions of heightened uncertainty.

Third, the OLI framework is somewhat static in its assumption that market seeking and efficiency advantages simply exist in a country, and if a company does relocate production it will be able to capitalise on these advantages. Our findings suggest that companies moved facilities due to geopolitical disruption and future expectations that access to markets was likely to change. Similarly, UK companies moved to the EU in the hope of benefitting from future trading relationships with other countries. At the same time, UK companies were moving between the UK and the EU because of expected disruptions to trade flows between the two states and cost implications related to tariff and non-tariff barriers. These findings contribute to the OLI framework by suggesting that the manufacturing location decision is driven by managerial expectations of future events, and not necessarily by existing conditions within target markets.

## *6.2 Managerial Implications*

This study offers managers a framework for understanding the decision-making process for the location of manufacturing SCs during geopolitical disruptions (see Figure 4). The framework highlights that managers are often making decisions within tight timelines, with incomplete information. Our findings show that geopolitical disruptions only exacerbate these conditions and create situations of heightened uncertainty. In such conditions, our framework suggests that MNCs, as lead orchestrators of global SCs, prioritise the smooth flow of goods across national borders and the maintenance of market access. Ensuring undisrupted supply was found to be paramount to strategy-seeking and resource-seeking advantages. Market access and supply continuity also outweighed moving production to take advantage of low cost labour or improved infrastructure, indicating that a holistic SC perspective that prioritises an end-to-end SC that delivers to key markets is needed. The framework highlights that relocating production can also provide future market access, as nation states strike new trade deals with third-countries.



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Furthermore, our findings indicate that the type of industry affects the relocation decision, with healthcare, automotive, aerospace, food, and pharmaceuticals being the most affected by the geopolitical disruption under study. These five sectors are strategically important to the UK economy in terms of employment and GDP contribution, and are highly regulated by European agencies. The geopolitical disruption under study prompted the movement of EU regulatory bodies from the UK to the EU; this includes the EMA that moved from London to Amsterdam. Regulatory agencies also changed their jurisdiction as an outcome of Brexit, such as the EMA now having primary oversight for the 27 EU Member States, while the Medicines and Healthcare Products Regulatory Agency has taken control of UK pharmaceutical regulation. Therefore, we encourage managers in highly regulated industries to plan in advance for significant shifts in regulatory regimes that can occur due to geopolitical disruptions.

*6.3 Research Limitations and Future Research*

The results of this study should be viewed in light of its limitations. Our study adopted a theory elaboration approach and aimed for analytical generalisation of the findings. We do not claim that our findings have achieved statistical generalisation as this would require a large scale survey based on a greater sample of company managers. Our study is limited to only investigating the manufacturing sector, whereas service industries also play an important role in the UK economy. We encourage future researchers to use statistical methods to test the validity of our propositions and framework in the context of other geopolitical disruptions in a range of manufacturing and service-based industries.

The outcome of this research is also limited to the timeframe in which the data collection was conducted (December 2018 to November 2019). Further research is required to examine the findings after the Brexit transition period, once the trade deals are negotiated and finalised between the UK and the EU. When the trading relationship is finalised, managers will no longer be making decisions in a high uncertainty environment with imperfect information. Better information will bring clarity to the costs and sales advantages of relocation, and simplify the location decision-making process. Future studies could examine the shoring decision before and after the geopolitical disruption occurs to further examine the role of bounded rationality and imperfect information on the decision-making process. Our findings support the longitudinal study on the Brexit phenomenon conducted by Roscoe et al. (2020); this asserts that as strategic context changes, a firm’s strategy to achieve fit with the external business environment will also change. We call on future researchers to use alternative data collection

and analysis approaches, such as in-depth interviews, to examine the unique set of properties and decision characteristics experienced by companies during other geopolitical disruptions.

## References

- Bals, L., Kirchoff, J.F. and Foerstl, K. (2016), "Exploring the reshoring and insourcing decision making process: toward an agenda for future research", *Operations Management Research*, *Operations Management Research*, Vol. 9 No. 3–4, pp. 102–116.
- Blome, C. and Schoenherr, T. (2011), "Supply chain risk management in financial crises—A multiple case-study approach", *Enterprise Risk Management in Operations*, Vol. 134 No. 1, pp. 43–57.
- Buckley, C.C. (1994), "Delphi technique supplies the classic result?", *Australian Library Journal*, Vol. 43 No. 3, pp. 158–164.
- Cantwell, J., & Narula, R. (2001) *The Eclectic Paradigm in the Global Economy*, *International Journal of the Economics of Business*, 8:2, 155-172, DOI: 10.1080/13571510110051504
- Chen, W., Los, B., McCann, P., Ortega-Argilés, R., Thissen, M. and van Oort, F. (2017), "The continental divide? Economic exposure to Brexit in regions and countries on both sides of The Channel", *Papers in Regional Science*, Vol. 97 No. 1, pp. 25–54.
- Craighead, C.W., Blackhurst, J., Rungtusanatham, M.J. and Handfield, R.B. (2007), "The Severity of Supply Chain Disruptions: Design Characteristics and Mitigation Capabilities", *Decision Sciences*, Vol. 38 No. 1, pp. 131–156.
- Cumming, D. J., & Zahra, S. A. (2016). International business and entrepreneurship implications of Brexit. *British Journal of Management*, 27(4), 687-692.
- de Sá, M.M., Miguel, P., Brito, R. and Pereira, S. (2019), "Supply chain resilience: the whole is not the sum of the parts", *International Journal of Operations & Production Management*, Vol. 40 No. 1, pp. 92–115
- Devinney, T., Midgley, D. and Venaik, S. (2003), "Managerial beliefs, market contestability and dominant strategic orientation in the eclectic paradigm", in Cantwell, J. and Narula, R. (Eds.), *International Business and the Eclectic Paradigm: Developing the OLI Framework*, Routledge.
- Dhingra, S. (2019) Brexit and the future of trade. *Political Quarterly*, 90 (S2). pp. 21-31. ISSN 0032-3179
- Dhingra, S., Ottaviano, G., Sampson, T. and Reenen, J. Van. (2016a), "The consequences of Brexit for UK trade and living standards", *Center for Economic Performance*, Vol. April, pp. 4–10.
- Dhingra, S., Ottaviano, G., Sampson, T., & Van Reenen, J. (2016b). The impact of Brexit on foreign investment in the UK. *BREXIT 2016*, 24(2).
- Dhingra, S., Ottaviano, G., Rappoport, V., Sampson, T., & Thomas, C. (2018). UK trade and FDI: A post-Brexit perspective. *Papers in Regional Science*, 97(1), 9-24.
- Dunning, J.H. (1998), "Location and the multinational enterprise: A neglected factor?", *International International Business Studies*, Vol. 29, pp. 45–66.
- Dunning, J. H. (2001). The eclectic (OLI) paradigm of international production: past, present and future. *International journal of the economics of business*, 8(2), 173-190.
- Dunning, J.H. (2015), "The Eclectic Paradigm of International Production: A Restatement and Some Possible Extensions", in Cantwell, J. (Ed.), *The Eclectic Paradigm: A Framework*

- for Synthesizing and Comparing Theories of International Business from Different Disciplines or Perspectives, Palgrave Macmillan UK, London, pp. 50–84.
- Dunning, J. H., & Archer, H. (1987). The Eclectic Paradigm and the Growth of UK Multinational Enterprise 1870-1983. *Business and Economic History*, 19-49.
- Dunning, J.H. and Lundan, S.M. (2008), *Multinational Enterprises and the Global Economy*, Edward Elgar Publishing.
- Ellram, L.M., Tate, W.L. and Petersen, K.J. (2013), “Offshoring and Reshoring: An Update on the Manufacturing Location Decision”, *Journal of Supply Chain Management*, John Wiley & Sons, Ltd, Vol. 49 No. 2, pp. 14–22.
- EU Commission (2019), DG Trade Statistical Guide. Available at: [https://ec.europa.eu/trade/policy/eu-position-in-world-trade/statistics/index\\_en.htm](https://ec.europa.eu/trade/policy/eu-position-in-world-trade/statistics/index_en.htm) (accessed 7 April 2020).
- Ferdows, K. (2018), “Keeping up with growing complexity of managing global operations”, *International Journal of Operations and Production Management*, Vol. 38 No. 2, pp. 390–402.
- Ferdows, K., Vereecke, A. and De Meyer, A. (2016), “Delaying the global production network into congruent subnetworks”, *Journal of Operations Management*, Elsevier Ltd, Vol. 41, pp. 63–74.
- Forbes. (2020), “Auto Execs Say U.S. Mexico Canada Trade Pact Will Have Positive Effects”, 19 January, available at: <https://www.forbes.com/sites/jacknerad2/2019/01/19/auto-execs-say-u-s-mexico-canada-trade-pact-will-have-positive-effects/#4530ffe162b7> (accessed 7 April 2020).
- Fratocchi, L., Ancarani, A., Barbieri, P., Di Mauro, C., Nassimbeni, G., Sartor, M., Vignoli, M., et al. (2016), “Motivations of manufacturing reshoring: an interpretative framework”, *International Journal of Physical Distribution and Logistics Management*, Vol. 46 No. 2, pp. 98–127.
- Fratocchi, L., Di Mauro, C., Barbieri, P., Nassimbeni, G. and Zanoni, A. (2014), “When manufacturing moves back: Concepts and questions”, *Journal of Purchasing and Supply Management*, Elsevier, Vol. 20 No. 1, pp. 54–59.
- Fynes, B., Coughlan, P., Brennan, L., Ferdows, K., Godsell, J., Golini, R., ... & Taylor, M. (2015). *Manufacturing in the world: where next?*. *International Journal of Operations & Production Management*. Vol. 35 No. 9, pp. 1253-1274
- Gray, J. V., Esenduran, G., Rungtusanatham, M.J. and Skowronski, K. (2017), “Why in the world did they reshore? Examining small to medium-sized manufacturer decisions”, *Journal of Operations Management*, Vol. 49–51, pp. 37–51.
- Gray, J. V., Skowronski, K., Esenduran, G., & Johnny Rungtusanatham, M. (2013). The reshoring phenomenon: what supply chain academics ought to know and should do. *Journal of Supply Chain Management*, 49(2), 27-33
- Grisham, T. (2009), “The Delphi technique: a method for testing complex and multifaceted topics”, *International Journal of Managing Projects in Business*, Vol. 2 No. 1, pp. 112–130.
- Häder, M. (2009), *Delphi-Befragungen: Ein Arbeitsbuch*. Springer-Verlag.
- Handfield, R.B., Graham, G. and Burns, L. (2020), “Corona virus, tariffs, trade wars and supply chain evolutionary design”, *International Journal of Operations & Production*

- Management, Vol. ahead-of-print No. ahead-of-print., available at: <https://doi-org.ezproxy.sussex.ac.uk/10.1108/IJOPM-03-2020-0171>.
- Hansen, C., Mena, C. and Skipworth, H. (2017), "Exploring political risk in offshoring engagements", *International Journal of Production Research*, Taylor & Francis, Vol. 55 No. 7, pp. 2051–2067.
- Hartman, P.L., Ogden, J. A., Wirthlin, J.R. and Hazen, B.T. (2017), "Nearshoring, reshoring, and insourcing: Moving beyond the total cost of ownership conversation". *Business Horizons*, Vol. 60 No. 3, pp. 363–373.
- Hendricks, K.B. and Singhal, V.R. (2003), "The effect of supply chain glitches on shareholder wealth", *Journal of Operations Management*, Vol. 21 No. 5, pp. 501–522.
- Hendricks, K.B. and Singhal, V.R. (2005a), "An Empirical Analysis of the Effect of Supply Chain Disruptions on Long-Run Stock Price Performance and Equity Risk of the Firm", *Production and Operations Management*, Vol. 14 No. 1, pp. 35–52.
- Hendricks, K.B. and Singhal, V.R. (2005b), "Association Between Supply Chain Glitches and Operating Performance", *Management Science*, Vol. 51 No. 5, pp. 695–711.
- Hendry, L.C., Stevenson, M., MacBryde, J., Ball, P., Sayed, M. and Liu, L. (2019), "Local food supply chain resilience to constitutional change: the Brexit effect", *International Journal of Operations and Production Management*, Vol. 39 No. 3, pp. 429–453.
- Ho, W., Zheng, T., Yildiz, H. and Talluri, S. (2015), "Supply chain risk management: A literature review", *International Journal of Production Research*, Taylor & Francis, Vol. 53 No. 16, pp. 5031–5069.
- Ivanov, D., Pavlov, A., Dolgui, A., Pavlov, D. and Sokolov, B. (2016), "Disruption-driven supply chain (re)-planning and performance impact assessment with consideration of proactive and recovery policies", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 90, pp. 7–24.
- Ketokivi, M., & Choi, T. (2014). Renaissance of case research as a scientific method. *Journal of Operations Management*, 32(5), 232–240.
- Kinkel, S. (2012). Trends in production relocation and backshoring activities. *International Journal of Operations & Production Management*. Vol. 32 No. 6, pp. 696–720
- Kleindorfer, P.R. and Saad, G.H. (2005), "Managing Disruption Risks in Supply Chains", *Production and Operations Management*, Vol. 14 No. 1, pp. 53–68.
- Knemeyer, A.M., Zinn, W. and Eroglu, C. (2009), "Proactive planning for catastrophic events in supply chains", *Special Issue: Perspectives on Risk Management in Supply Chains*, Vol. 27 No. 2, pp. 141–153.
- Kotios, V. and Braithwaite, A. (2017), "Investigation of the supply chain impacts and opportunities for the UK of Brexit", *Proceedings of the 22nd Annual Logistics Research Network Conference*, Southampton, pp. 1–12.
- Ludwig, B. (1997). Predicting the future: Have you considered using the Delphi methodology. *Journal of extension*, 35(5), 1–4.
- MacCarthy, B.L. and Atthirawong, W. (2003), "Factors affecting location decisions in international operations - A Delphi study", *International Journal of Operations and Production Management*, Vol. 23 No. 7–8, pp. 794–818

- Mann, C.L. (2012), "Supply Chain Logistics, Trade Facilitation and International Trade: A Macroeconomic Policy View", *Journal of Supply Chain Management*, Vol. 48 No. 3, pp. 7–14
- March, J. G., & Shapira, Z. (1987). Managerial perspectives on risk and risk taking. *Management science*, 33(11), 1404-1418.
- Mcivor, R. (2013), "Understanding the Manufacturing Location Decision : The Case for the Transaction Cost and Capability Perspectives", *Journal of Supply Chain Management*, Vol. 49 No. 2, pp. 23–26.
- Meijboom, B. and Vos, B. (1997), "International manufacturing and location decisions: Balancing configuration and co-ordination aspects", *International Journal of Operations and Production Management*, Vol. 17 No. 8, pp. 790–805.
- Moradlou, H., Backhouse, C. and Ranganathan, R. (2017), "Responsiveness, the primary reason behind re-shoring manufacturing activities to the UK: An Indian industry perspective", *International Journal of Physical Distribution and Logistics Management*, Vol. 47 No. 2–3, pp. 222–236.
- Moradlou, H. and Backhouse, C.J. (2016), "A review of manufacturing re-shoring in the context of customer-focused postponement strategies", *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, Vol. 230 No. 9, pp. 1561–1571.
- Moradlou, H., Fratocchi, L., Skipworth, H. and Ghadge, A. (2021). Post-Brexit back-shoring strategies: What UK manufacturing companies could learn from the past? *Production Planning and Control*. DOI: 10.1080/09537287.2020.1863500
- Narula, R. and Hagedoorn, J. (1999), "Innovating Through Strategic Alliances: Moving Towards International Partnerships and Contractual Agreements", *Technovation*, 19, pp. 283–294.
- New York Times. (2020a), "Trump Just Signed the U.S.M.C.A. Here's What's in the New NAFTA.", 29 January, available at: <https://www.nytimes.com/2020/01/29/business/economy/usmca-deal.html> (accessed 7 April 2020).
- New York Times. (2020b), "Trump Signs China Trade Deal, Putting Economic Conflict on Pause", *Trump Signs China Trade Deal, Putting Economic Conflict on Pause*, 15 January, available at: <https://www.nytimes.com/2020/01/15/business/economy/china-trade-deal.html> (accessed 12 March 2020).
- Norrman, A. and Jansson, U. (2004), "Ericsson's proactive supply chain risk management approach after a serious sub-supplier accident", *International Journal of Physical Distribution & Logistics Management*, Vol. 34 No. 5, pp. 434–456.
- Reefke, H. and Sundaram, D. (2017), "Key themes and research opportunities in sustainable supply chain management – identification and evaluation", *Omega (United Kingdom), Elsevier*, Vol. 66, pp. 195–211.
- Reefke, H. and Sundaram, D. (2018), "Sustainable supply chain management: Decision models for transformation and maturity", *Decision Support Systems*, Elsevier, Vol. 113 No. July, pp. 56–72.
- Roscoe, S., Skipworth, H., Aktas, E. and Habib, F. (2020), "Managing supply chain uncertainty arising from geopolitical disruptions: evidence from the pharmaceutical industry and



- Brexit”, *International Journal of Operations and Production Management*, available at: <https://doi.org/10.1108/IJOPM-10-2019-0668>.
- Rowe, G., Wright, G., & Bolger, F. (1991). Delphi: A reevaluation of research and theory. *Technological Forecasting and Social Change*, 39(3), 235-251. doi:10.1016/0040-1625(91)90039-i
- Safonovs, R., & Upadhyay, A. (2017). Is your Brexit supply chain resilient enough? The British footwear manufacturers’ perspective. *Strategic Direction*. vol. 33 no. 11, pp. 34-36
- Scheele, D. S. (2002). Reality construction as a product of Delphi interaction. In H. A. Linstone & M. Turoff (Eds.), *The Delphi method - techniques and applications* (pp. 35-67). Reading, MA: Addison-Wesley.
- Scheibe, K. P., & Blackhurst, J. (2018). Supply chain disruption propagation: a systemic risk and normal accident theory perspective. *International Journal of Production Research*, 56(1-2), 43-59.
- Simon, H. A. (1991). Bounded rationality and organizational learning. *Organization science*, 2(1), 125-134.
- Sheffi, Y. (2001), “Supply Chain Management under the Threat of International Terrorism”, *The International Journal of Logistics Management*, Vol. 12 No. 2, pp. 1–11.
- Sodhi, M.S. and Tang, C.S. (2014), “Buttressing Supply Chains against Floods in Asia for Humanitarian Relief and Economic Recovery”, *Production and Operations Management*, Vol. 23 No. 6, pp. 938–950.
- Srai, J.S. and Ané, C. (2016), “Institutional and strategic operations perspectives on manufacturing reshoring”, *International Journal of Production Research*, Taylor & Francis, Vol. 54 No. 23, pp. 7193–7211.
- Tate, W.L. and Bals, L. (2017), “Outsourcing/offshoring insights: going beyond reshoring to rightshoring”, *International Journal of Physical Distribution and Logistics Management*, Vol. 47 No. 2–3, pp. 106–113.
- Theyel, G., Hofmann, K., & Gregory, M. (2018), “Understanding manufacturing location decision making: rationales for retaining, offshoring, reshoring, and hybrid approaches”. *Economic Development Quarterly*, Vol. 32 No. 4, pp. 300-312
- UK Industrial Strategy, (2017), *Industrial Strategy: building a Britain fit for the future*. , available at: <https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future> (accessed 15 May 2020).
- Wagner, S.M. and Bode, C. (2008), “An Empirical Examination of Supply Chain Performance Along Several Dimensions of Risk”, *Journal of Business Logistics*, Vol. 29 No. 1, pp. 307–325.
- Williamson, O.E. (1987), “Transaction cost economics: The comparative contracting perspective”, *Journal of Economic Behavior & Organization*, Vol. 8 No. 4, pp. 617–625.
- World Economic Forum. (2020), “Geopolitical Power Shifts”, *Geopolitical Power Shifts*, available at: <https://reports.weforum.org/global-risks-2018/geopolitical-powershift/> (accessed 21 January 2020).

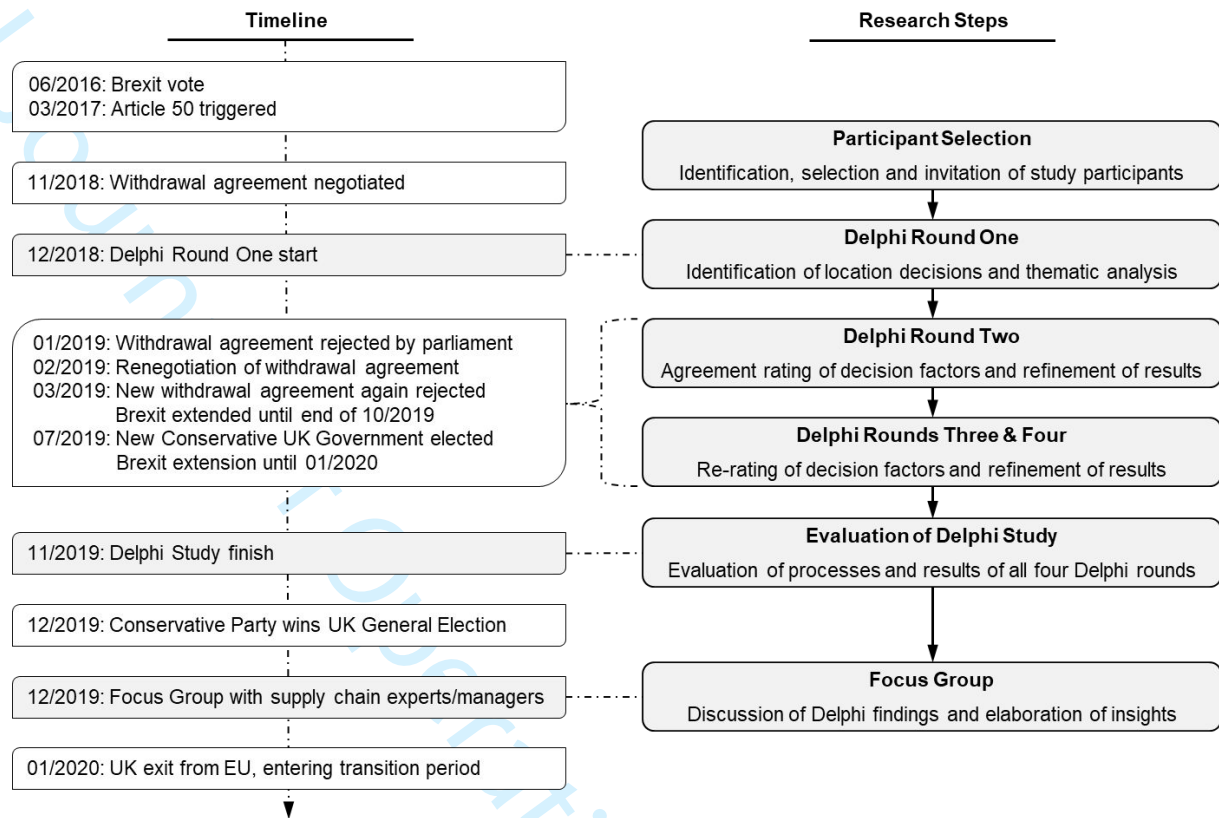


Figure 1: Brexit timeline and sequence of research steps

Table 1: Delphi panellists and organisations

Panel	Organisation type	Round 1	Round 2	Round 3	Round 4
Expert	Professional, scientific, and technical activities	7	9	8	8
	Education	7	6	6	6
Manager	Manufacturing	9	9	7	6
	Transportation and storage	2	2	2	2
	Other service	3	4	4	4
Total:		28	30	27	26

Manager Panel Details		Round 1	Round 2	Round 3	Round 4
Organisational headcount	0-9	1	1	1	1
	50-249	1	1	1	0
	250+	12	13	11	11
Geographical dispersion	UK, EU	5	5	4	5
	UK, EU, Global	9	10	9	7
Total:		14	15	13	12

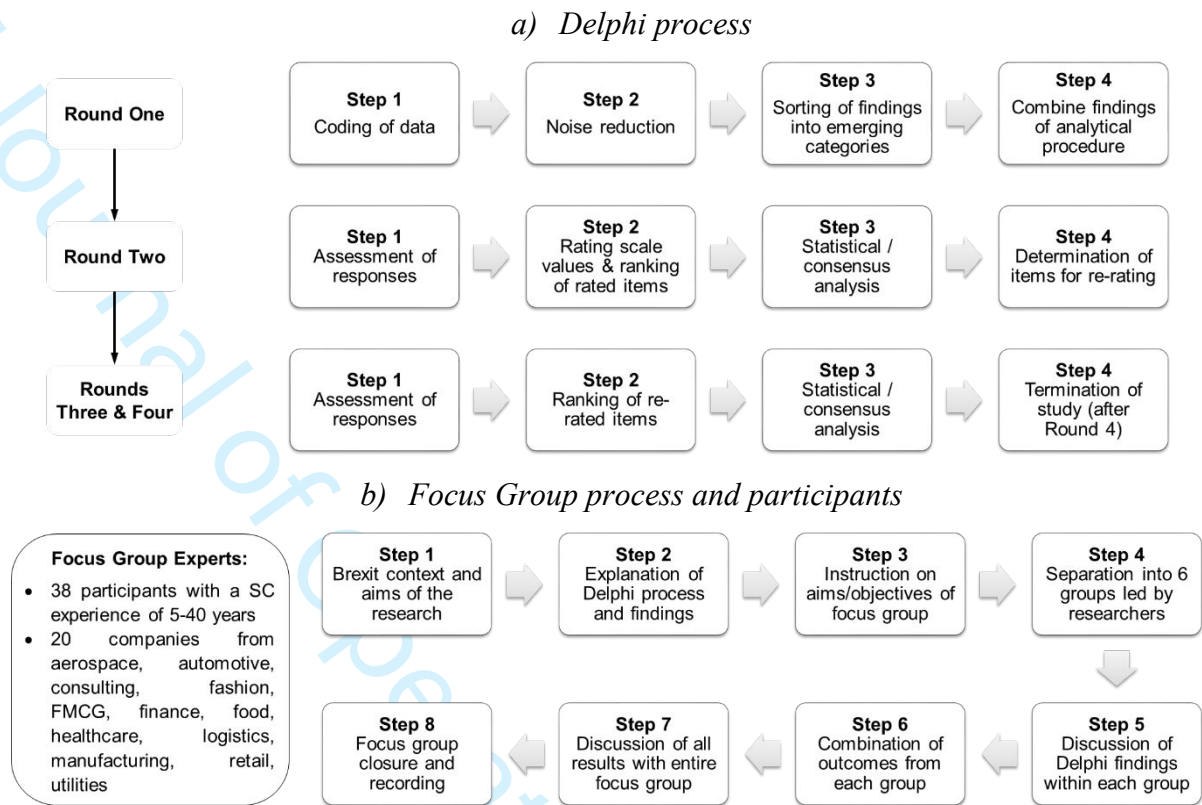


Figure 2: a) Analysis process of the Delphi rounds, b) Focus Group process and participants

a) Delphi items and consensus across rounds

	Initial items	Additions	Consensus achieved
Round 2	38 (+8)	-	16
Round 3	30	36	42
Round 4	24	-	20
Total	82 items overall		78 achieved consensus

b) Consensus building process – Rounds 2 to 4

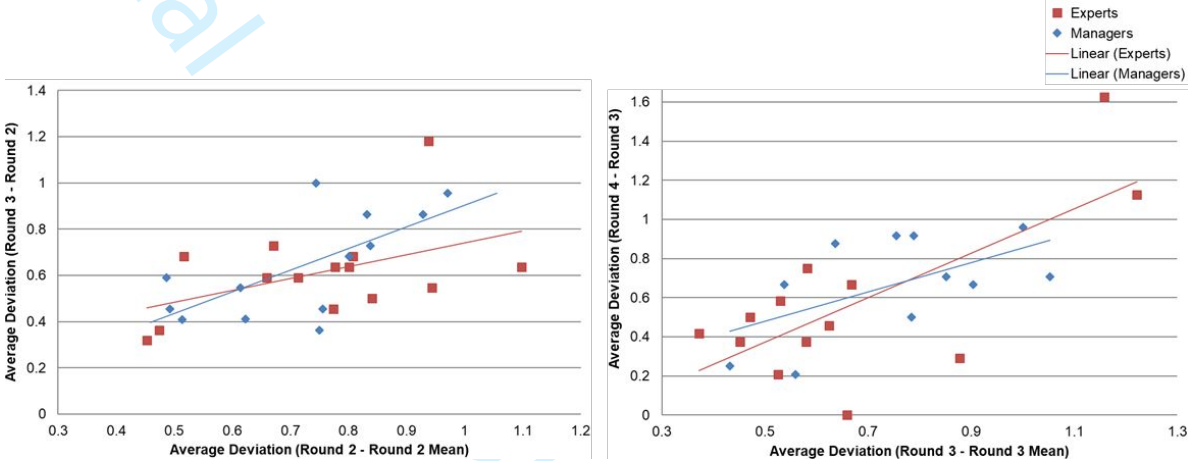


Figure 3, a) Delphi items and consensus across rounds, b) Consensus building process – Rounds 2 to 4

*Table 2: Industries where manufacturing, suppliers and DC locations are impacted to the greatest degree by Brexit*

	<b>Manufacturing</b>	<b>Average</b>	<b>SD</b>	<b>Suppliers</b>	<b>Average</b>	<b>SD</b>	<b>Distribution</b>	<b>Average</b>	<b>SD</b>
<b>1</b>	<b>Automotive</b>	<i>4.19</i>	<i>0.68</i>	<b>Automotive</b>	<i>4.11</i>	<i>0.64</i>	<b>Pharmaceutical</b>	<i>4.04</i>	<i>0.89</i>
<b>2</b>	<b>Pharmaceutical</b>	<i>4.12</i>	<i>0.93</i>	<b>Food</b>	<i>4.08</i>	<i>0.80</i>	<b>Automotive</b>	<i>4.00</i>	<i>0.83</i>
<b>3</b>	<b>Food</b>	<i>4.04</i>	<i>0.77</i>	<b>Pharmaceutical</b>	<i>4.04</i>	<i>0.89</i>	<b>Food</b>	<i>4.00</i>	<i>0.75</i>
<b>4</b>	<b>Healthcare</b>	<i>4.00</i>	<i>0.91</i>	<b>Healthcare</b>	<i>4.00</i>	<i>0.96</i>	<b>Healthcare</b>	<i>3.96</i>	<i>0.89</i>
<b>5</b>	<b>Aerospace</b>	<i>4.00</i>	<i>0.69</i>	<b>Aerospace</b>	<i>3.92</i>	<i>0.63</i>	<b>Aerospace</b>	<i>3.73</i>	<i>0.72</i>
<b>6</b>	<b>FMCG</b>	<i>3.92</i>	<i>0.40</i>	<b>Electronic</b>	<i>3.68</i>	<i>0.85</i>	<b>FMCG</b>	<i>3.58</i>	<i>0.76</i>
<b>7</b>	<b>Electronic</b>	<i>3.76</i>	<i>0.88</i>	<b>FMCG</b>	<i>3.62</i>	<i>0.75</i>	<b>Electronic</b>	<i>3.54</i>	<i>0.99</i>
<b>8</b>	<b>Fashion</b>	<i>3.08</i>	<i>0.98</i>	<b>Fashion</b>	<i>3.60</i>	<i>0.76</i>	<b>Fashion</b>	<i>3.35</i>	<i>0.94</i>



Table 3: Ranked drivers for moving manufacturing (the top and bottom five drivers have been highlighted and labelled \*\*)

Drivers for moving manufacturing facilities						
	From the UK to the EU	Average	SD	Keeping production in the UK	Average	SD
1	Access to the EU market	4.22	0.8	Proximity to customers in the UK	4.00	0.6
2	Delays in product delivery due to new border control	4.03	0.5	To avoid non-tariff costs (such as border delays and inventory levels) of importing to the UK	4.00	0.5
3	Higher costs through new tariffs for imports/exports to the EU	3.97	0.7	High cost of transferring operations	4.00	0.5
4	Access to international markets through EU trade deals	3.93	0.6	Customer service agreements	3.96	0.3
5	Favourable currency conditions (exchange rates, stability, same currency trades, etc.)	3.92	0.3	To avoid tariff costs of importing to the UK	3.70	0.7
6	Proximity to customers in the EU	3.85	0.5	Access to R&D	3.69	0.5
7	Business consolidation with other facilities	3.81	0.5	Access to suppliers	3.57	0.7
8	Higher non-tariff costs, such as inventory levels, of import/export to the EU	3.77	0.7	Uncertain regulations (Customs arrangements)	3.54	0.6
9	Higher stability (political, financial, regulations, etc.) of the destination country	3.77	0.5	Government incentives offered by the UK**	3.42	0.5
10	EU approval procedures (e.g., for medicines/drugs) and respective access to market	3.74	0.8	Possible removal or lowering of taxation**	3.35	0.6
11	EU standard regulations	3.73	0.7	UK R&D taxation regulations**	3.31	0.6
12	Uncertainty and fear	3.70	0.7	Access to labour**	3.00	0.6
13	Uncertain regulations with respect to Customs arrangements	3.67	0.8	Lower cost of manufacturing in the UK**	2.85	0.7
14	Access to suppliers	3.63	0.7			
15	Market competition forces/encourages a move to the EU	3.59	0.6			
16	Government incentives offered by EU countries **	3.22	0.6			
17	Declining demand and unprofitable plants in the UK**	3.19	0.9			
18	Access to skilled labour**	3.19	0.6			
19	Access to R&D**	2.93	0.7			
20	Lower cost of manufacturing in the EU**	2.15	0.5			

Table 4: Relationship between the Eclectic Theory location advantages and drivers behind Brexit relocations (the top and bottom five drivers have been highlighted and labelled)

<i><b>Eclectic Paradigm</b></i>	<i><b>Drivers for relocating manufacturing to the EU</b></i>	<i><b>Drivers for keeping production in the UK</b></i>
<i>Resource-seeking advantage</i>	-Access to R&D**	-Access to R&D
<i>Market-seeking advantage</i>	<b>-Access to international markets through EU trade deals</b> <b>-Access to the EU market</b> -Market competition forces/encourages a move to the EU -Proximity to customers in the EU -Higher stability (political, financial, regulations, etc.) of the destination country -EU standard regulations -Uncertain regulations with respect to Customs arrangements -EU approval procedures (e.g., for medicines/drugs) and respective access to market -Access to suppliers -Uncertainty and fear -Declining demand and unprofitable plants in the UK** -Access to skilled labour**	<b>-Proximity to customers in the UK</b> <b>-Customer service agreements</b> -Uncertain regulations (Customs arrangements) -Access to suppliers -Access to skilled labour**
<i>Efficiency-seeking advantage</i>	<b>-Higher costs through new tariffs of import/export to the EU</b> <b>-Delays in product delivery due to new border control</b> <b>-Favourable currency conditions (exchange rates, stability, same currency trades, etc.)</b> -Higher non-tariff costs, such as inventory levels, of import/export to the EU -Business consolidation with other facilities -Lower cost of manufacturing in the EU** -Government incentives offered by EU countries**	<b>-To avoid non-tariff costs (such as border delays and inventory levels) of importing to the UK</b> <b>-To avoid tariff costs of importing to the UK</b> <b>-High cost of transferring operations</b> -Lower cost of manufacturing in the UK** -Government incentives offered by the UK** -UK R&D taxation regulations** -Possible removal or lowering of taxation**
<i>Strategic asset-seeking advantage</i>	None	None

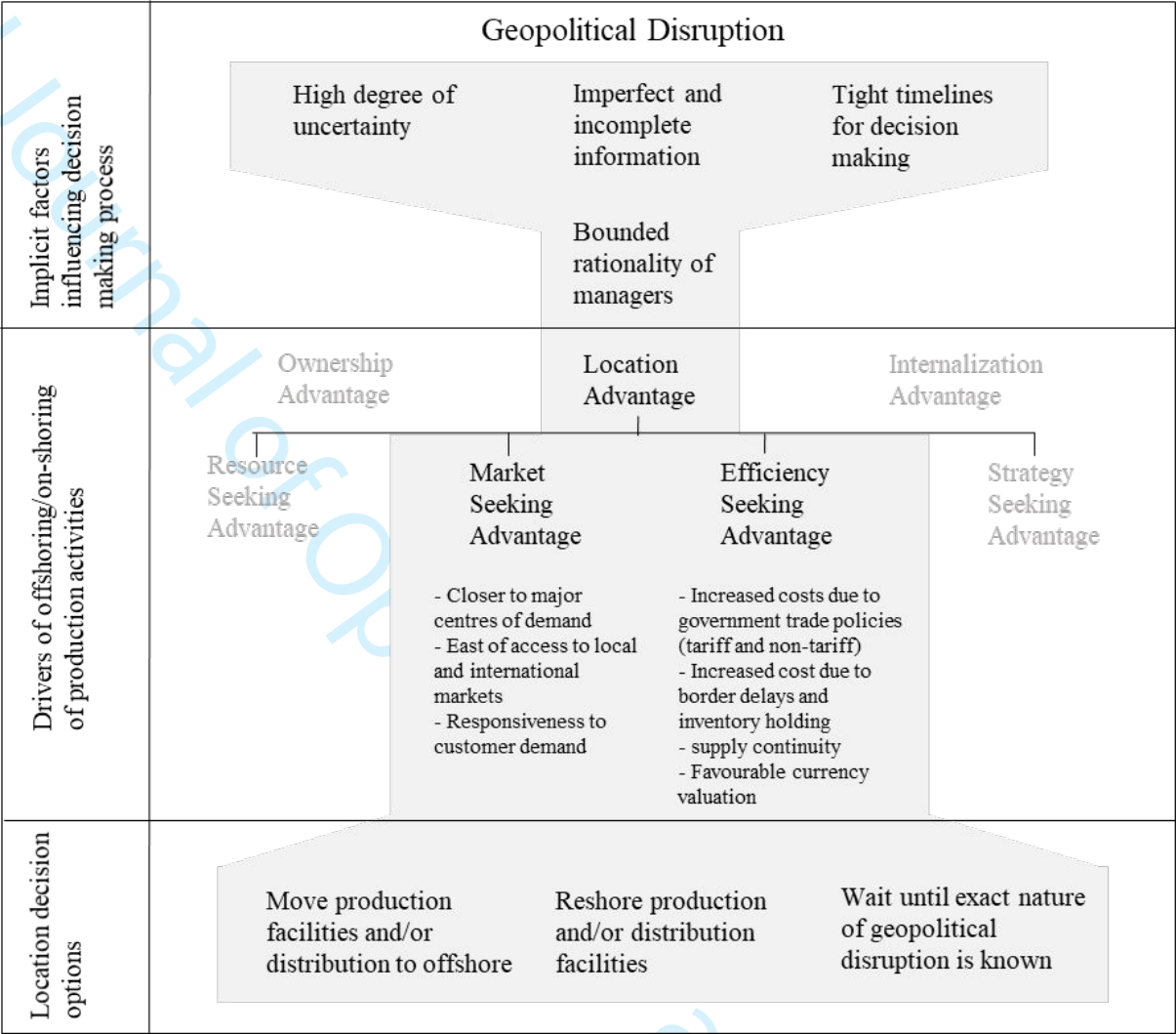


Figure 4: Managerial framework for the manufacturing location decision-making process in the context of geopolitical disruptions